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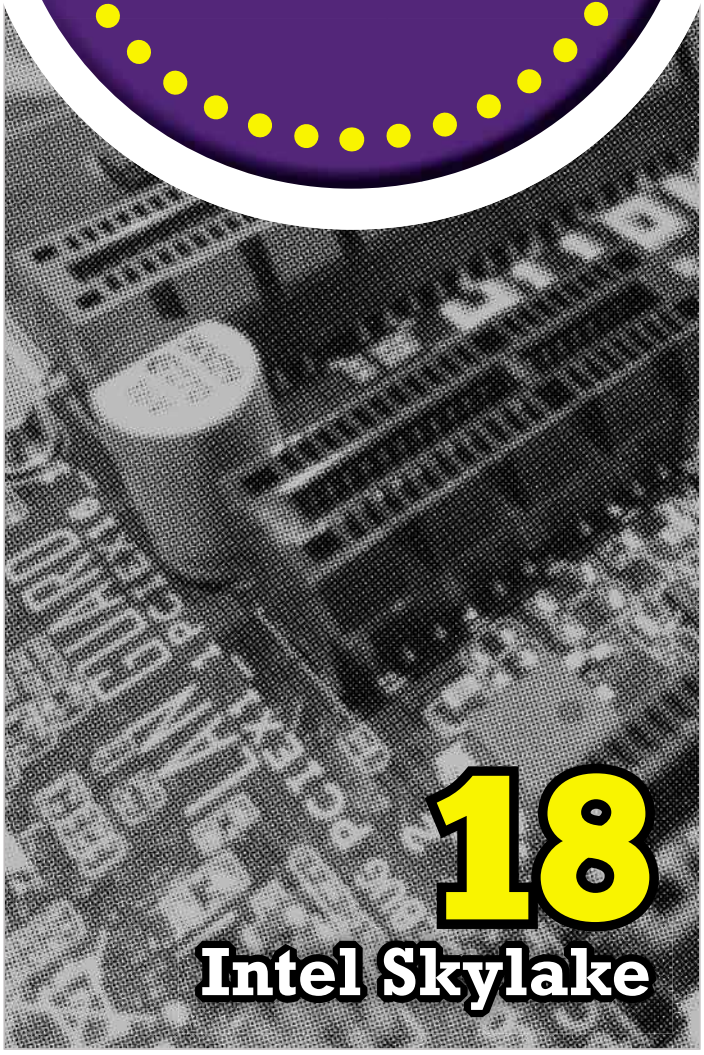

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21 Ways To **Speed Up** Your Home Network

Does your home network feel a little sluggish? We have some solutions for you to try out

A home network a mere 15 years ago was something only serious computing enthusiasts could brag about. Since the advent of broadband, though, and with more complex routers being supplied by ISPs that handle this generation of broadband, home networks are now something virtually every home in the connected world has.

While, for the most part, home networks runs fairly smoothly once you've set up, very few people realise that you can further tweak them to squeeze out a little more performance.

For example, maybe you experience a drop in the wireless signal in your upper most back bedroom. Or perhaps that wired PC in the loft space seems to suffer from frequent disconnections from the network or struggles to load up HD content from the NAS unit downstairs. Maybe you have some connection problems when other gadgets are powered up? Maybe your entire home network slow.

No matter what problems we come across, most of the time we cope, botch and use some elaborate and ridiculously complex 'quick-fix' solution, the kind that would have Heath Robinson spinning in his grave.

With that in mind, we thought we'd look at 21 different ways in which you can speed up your home network, using a mixture of software tweaks and new hardware.

New Hardware

Let's get the paid-for solutions out of the way first, since we'd all rather speed things along without having to reach for our wallets.

Thankfully, new hardware isn't too expensive these days – not compared to a few years ago, at least.

1 A New Router

The obvious first choice to speed up your network is to buy an upgraded router, one that can deliver a faster base switching speed. In other words, you want a router with gigabit Ethernet as opposed to 100Mbps and one that can greatly improve the wireless connectivity as well.

For around £105, you can buy a Netgear DGND3700 N600, a fine router that comes with four gigabit Ethernet ports, a gigabit WAN port, and 2.4GHz and 5GHz dual band wi-fi. It's an excellent router and well worth the price. Alternatively, if you want to avoid any setup hassles that may come with a new router, you could always contact your ISP and ask them if it's possible for you to receive an upgraded router. The advantage of this, provided your contract is capable, is that you can usually get one for a minimal cost (even free in some cases), and it often comes already set up for your ISP's unique configuration.

➤ ***A new router can make a world of difference to your network speeds***

Gigabit switches are now very affordable and offer a huge speed advantage

2 A New Switch

A new router may be the hub of the home network, but it's really only the connection between you and the internet, so to speak. If you want to speed up your home network, but you're quite happy with the internet side of things from the router, then you'll be better off buying a gigabit switch or two, depending on how your network is set up.

If you use the new gigabit switch as your main networking hub, with a single connection leading to the router, and branch all the other wired devices off it, then the computers, consoles, NAS drives and so on will all communicate at the speed of the switch as opposed to the 100Mbps of the router's Ethernet ports.

It's not an ideal design, we'll grant you, but considering a five-port gigabit switch can be had for as little as £11 (the D-Link GO-SW-5G, for example), you'll certainly appreciate the transfer speeds to and from computers and a NAS drive with one in place.

3 Powerline Adapters

If you have one of those awkward houses where the wi-fi refuses to go any further than the front room and running cables is a task best left for a crack team of DIY experts, then to get the best speeds on your network a set of powerline adapters may be your only bet.

Powerline adapters get a lot of stick in the press, however. Although they state unparalleled speeds on the box, they usually fail to deliver anything close. However, a good set of powerline adapters can reach very close to those speeds, even on a less modern electrical wiring system.

A good example is the TP-Link AV1200 Gigabit Passthrough Powerline Starter Kit (**goo.gl/dTXAR0**). They're fast, have a good level of traffic management and feature a pass-through socket so you won't lose access to power either. Considering they only cost around £68, it's a good investment if you want faster than wi-fi speeds without the hassle of cabling.

4 Wi-fi Extenders

If your lack of speed is due to a poor wireless signal in hard-to-reach areas of your home, then a wi-fi extender could be a cheaper alternative to purchasing a brand new router.

Wi-fi extenders basically piggyback off your router's existing wireless coverage, boosting the signal over a larger area than the router alone can reach. They do work, and the extra coverage not only means you'll have a better connection – meaning increased speeds – but you'll also be able to serve more devices in that area too.

A good example of one is the ZyXEL WRE2205, which is remarkably cheap at around £20. It performs well and can easily add another ten metres to your existing network.

If you're going to use a powerline adapter, use a good one

5 Upgrade Your Networking

While your core network may be up to date, the networking hardware inside your PC or device might not be.

Sometimes there's not a huge amount we can do about the networking hardware inside a device, such as a tablet or a games console, but in terms of a PC, buying a better dual-band wireless card may speed up your network considerably.

Also, if you have an older motherboard, one with only a 10/100Mbps Ethernet port, then a new PCI gigabit Ethernet port will make a huge difference. Prices vary, but most start at around £20.

Hardware Tweaks

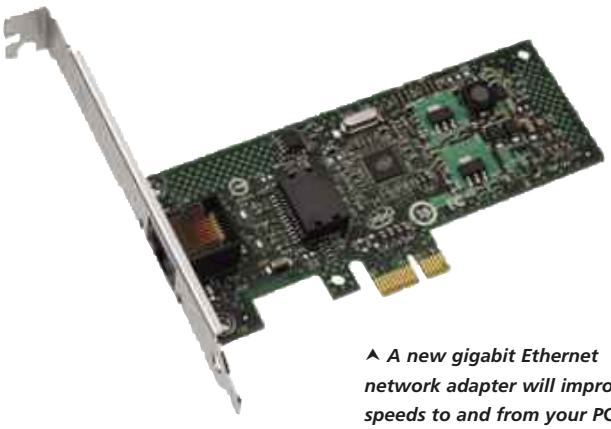
It would be nice to upgrade our network whenever we come across a bottleneck. We'd simply buy a new switch or two and extend the cables to the loft or the back bedroom. The same for the wireless signal too.

That's not the most economical way of improving your home network speeds, though, so what can we do with the stuff we already have?

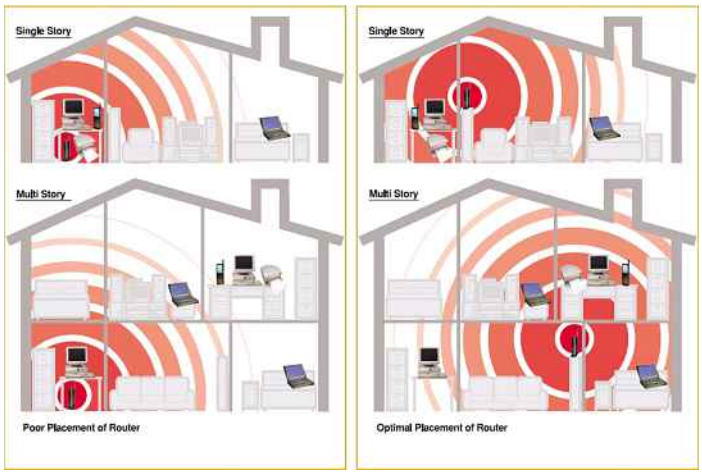
6 Reposition Your Router

This isn't an obvious one to begin with, as most people are quite happy with their router staying put in their living room and branching out from there. However, you'd be surprised to see how effective repositioning your router can actually be.

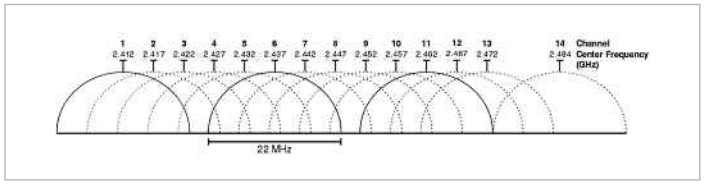
Take, for example, the wireless signal from your router. Wi-fi diminishes greatly with distance and when it has to travel through walls. Ideally, wi-fi devices should have direct sight to the wireless source – in other words, the router. This isn't always possible in the average home.



A new gigabit Ethernet network adapter will improve the speeds to and from your PC



Router placement means a better signal and improved speeds throughout



Cutting down on interference will speed up the connections

If you can plan your repositioning to eliminate as many obstructions as possible, with it being a little higher placed on a wall and maybe in the centre of your home, you may find an improvement in the wireless signal and better speeds.

Experimentation is the key here, and you may find that if all your wi-fi devices are used upstairs, with the wired stuff like a NAS box and smart TV downstairs, then upstairs would be a better placement for your router.

7 Signal Optimisation

Interference from other devices, even microwave ovens, can have an adverse effect on the broadcast signal of your router.

A poor signal means a poor connection, which in turn will lower the speed and reliability of your home network. Again, look to position the router away from anything that will interfere with the signal, particularly in the cluttered 2.4GHz range.

8 Change Channels

Your router will automatically pick a particular channel to broadcast its signal on, regardless of whether it's a 2.4GHz or 5GHz channel.

If you have a neighbour in close proximity who is using the same signal, then there's a good chance that the signals can end up interfering with each other.

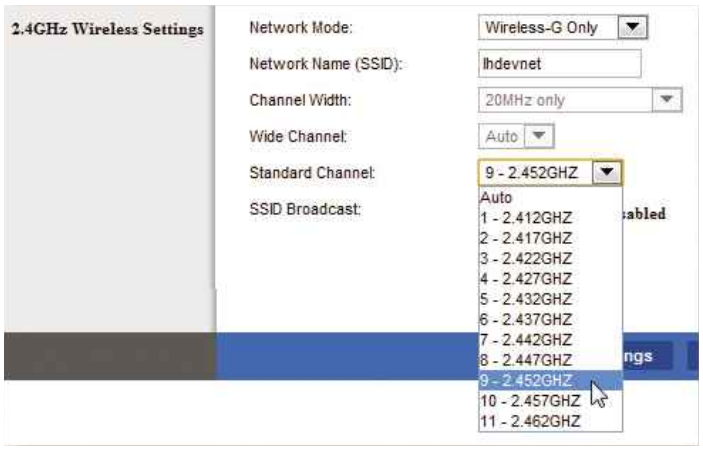
This interference can cause some severe speed drops in an otherwise well-oiled network. It'll take some experimentation again, but try the router's wi-fi with different channels to see if you can find one that offers the best connection without any interference.

9 Check Your Cables

For wired setups, the network speeds are often fairly rapid, and you won't notice a problem unless you experience another network with the same setup.

If, however, you think you're not getting your maximum speed via the Ethernet cable (plus it's generally good practice to do this anyway), it might be worth checking the state of your cables.

Although a cable can still transmit and receive data, it might not be doing it to its best abilities. Check the cable ends and make sure



Choosing a channel with less interference from neighbours is a good idea

that the coloured wire pairs match up to an Ethernet diagram. Also, check that the cable isn't being twisted or hasn't been partly sliced by furniture or when you originally fed it through the hole in the floor to reach downstairs.

As an extra piece of advice, check that the Ethernet cable isn't wrapped around a power cable, as this can cause interference with the data and slow down the overall speed of transmission.

10 Cable Length

The length of an Ethernet cable is one of most common causes for a slow wired network. If I remember correctly, an Ethernet cable can transmit data to a maximum of around 300 feet before the signal starts to degrade quite rapidly.

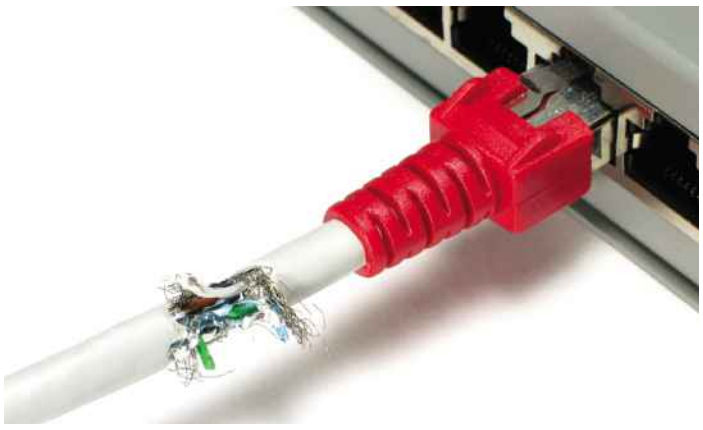
Although 300 feet is quite a distance for a house, you'd be surprised by what you'd see in some homes. A good example was when this writer once traced a problematic cable into a loft space, to find around 250 feet of it coiled up, before being dropped back down into another bedroom. In that case, snipping the coiled section off and joining the two ends together solved the problem.

To keep your wired network trim and speedy, keep your cables as short as possible without putting strain on the cable ends to the device.

11 Better Quality Cables

Although Ethernet cables, regardless of their cost, pretty much do the same thing and work at the same speeds, there can be a slight difference in the quality of the signal.

Some cables offer better shielding; others, like Cat5e, cut down on crosstalk interference. And Cat6 cables are an improvement again, with strict specifications and even less interference.



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Too much cable length is a common problem with home networks

So rather than buying a box of ultra-cheap Ethernet cable, perhaps go for the next cable type up (Cat5e will do for most home networks), and opt for a better quality of cable.

12 Run A Cable Where Possible

A quick and obvious one this, but one that's often missed. Cabling your house isn't an easy job most of the time, so people often avoid it. Using a powerline adapter is easier than running a cable, but it's slower and more unreliable.

For the best possible speeds on your home network, spend a bit of time planning out your cabling and neatly run one from one room to the next.

13 Don't Daisy Chain Your Switches

Although most home will only have one or two switches, some have considerably more. The temptation is to daisy chain each switch, with each one linking to the next, all the way back to the router.

But daisy chaining switches can cause speed and connectivity problems, so take time to cable in direct connections to the main router or switch to each switch individually.

14 Use A Switch, Not A Hub

The difference between a hub and a switch can be explained with the analogy of phone calls. In the case of a hub, you can take one call at a time, while switches allow for multiple-user teleconferencing calls, where you can speak to everyone at once.

Where possible, use a cable rather than wireless

It's a little more complex, of course, and other factors like duplex speeds come into effect, but suffice to say, a hub will result in less average bandwidth per user, because it's shared, whereas a switch dedicates bandwidth to each user.

15 Go Fibre

A little extreme, but if you're after the fastest possible speeds on your home network, then kitting yourself out with a fibre optic network is the fastest method. With speeds well beyond 10Gbps, a fibre setup will put your network in overdrive.
However, it'll also destroy your bank balance.

Software Tweaks

Sometimes, your hardware isn't at fault. Indeed, a 100Mbps network should be more than enough to stream a HD movie across a network without any problems. Nevertheless, we're often pressured into getting newer and faster hardware.

With that in mind, we'll finish off with some software tweaks to help you get more from your existing kit.

16 Disable TCP Auto-tuning

From Windows Vista onward, Microsoft included a feature called TCP Auto-tuning, to help improve performance for programs that receive TCP data.

It's a good idea, to some degree, but many users have reported that by turning the feature off they've noticed an increase in the speed across their home network.

To do this, drop into an administrator command prompt and enter:

```
netsh interface tcp set global autotuning=disabled
```

Press Enter and restart your computer. If you don't see a marked improvement, you can turn it back on with:

```
netsh interface tcp set global autotuning=normal
```

More Tips

In addition to the 21 tips in the main body of the article, here are a handful more worth trying:

1. Disable any virtual machine network adapters.

2. Instead of using Auto-Negotiation in your Link Speed and Duplex settings, within the network connection properties, select the maximum from the drop-down menu.

3. Enabling jumbo frames from the Advanced tab in the network controller properties can improve speeds, but your switch and router will need to support it.

4. Disable Homegroup and opt for a more traditional networking setup by having all PCs leave the Homegroup and disabling it. Then set up a classic network using the Advanced Share Settings on each PC.

5. Installing new network drivers may sound like an old wheeze, but drivers can become corrupt. Also, later versions could unlock the hardware to a better level. It's worth a look at least.

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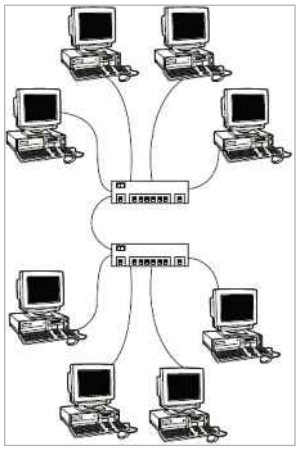
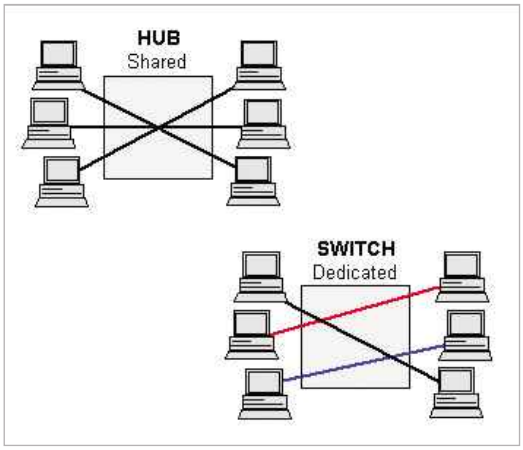
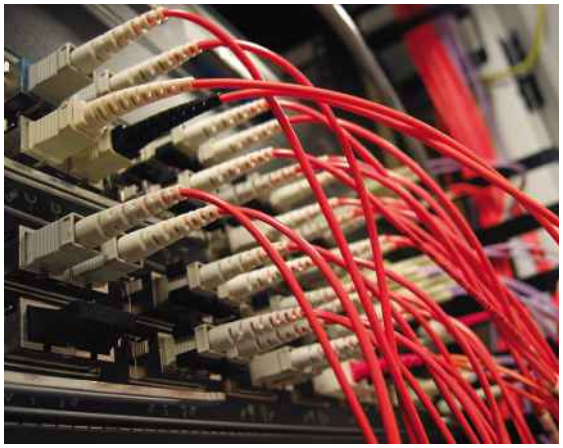


Try to avoid daisy chaining more than three switches



Use a switch instead of a hub if you have older kit



Using fibre optic cable is extreme but results in an ultra-fast network

17 Disable Large Send Offload Settings

Large Send Offload (LSO) is a feature that's supposed to improve the sending of files over a network while managing a reasonable CPU load. It's a feature from the days of lesser-powered processors, and it could help improve data transfer speeds across your home network.

To disable it, enter the Network and Sharing Centre and open the Network Connection, followed by right-clicking the active network connection and selecting Properties from the list.

Next, click on Configure under the name of the network connection and select the Advanced tab in the next window. Scroll down the list until you see both Large Send Offload v2 (IPv4) and the entry for IPv6. Highlight each and set the value drop-down box to Disabled.

Restart your PC and do the same for all the other computers on your network. With luck, you should see an improvement.

18 Up Your Receive Buffers

In the same Advanced tab as the previous tip, and further up the list, you should see an option for Receive Buffers.

Generally speaking, they're usually set to a default of 512 to help balance the amount of memory and resources the network connection takes from the system. However, there's a theory that modern PCs, with gigabytes of memory, can easily handle more buffers.

That being the case, feel free to knock it up to 1024 to see if it makes a difference. In some cases, you might not be able to, but it's worth a try.

19 Remove Remote Differential Compression

This is a tricky tip, as there's a split between those who swear that it can improve your home network and those who say it does nothing at all.

It's up to you, of course, so to see if it'll work on your network, simply click the Start button and enter 'Turn Windows features on or off', and you should be provided with a link to the Windows Features section within the Control Panel.

Scroll down a bit and you'll see an entry for Remote Differential Compression API Support. If the box is ticked, untick it and reboot your PC after Windows has removed the items.

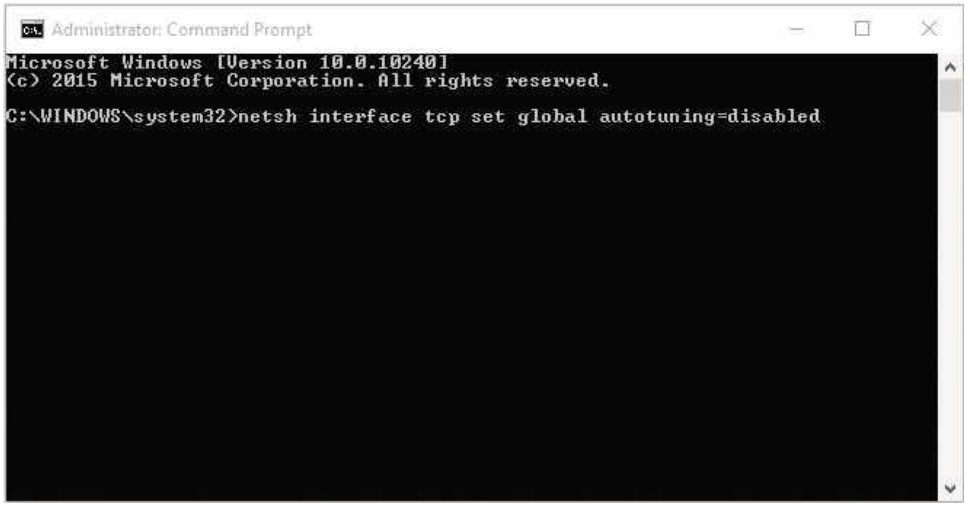
20 Remove IPv6 From The Network Connection

As has been recently announced, the last public IPv4 address was recently taken and IPv6 is still on the verge of being adopted globally.

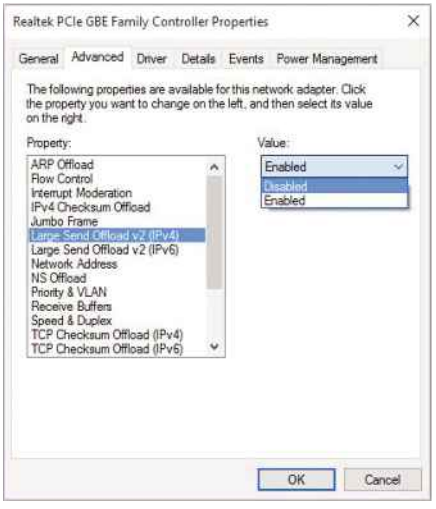
This, of course, doesn't affect our internal home networks, which will use IPv4 by default – as dealt with the router's DHCP. However, network adapters still have IPv6 enabled by default, and if you're absolutely sure that your routers doesn't use IPv6 internally, then go ahead and disable it to help speed things up a tad.

21 Clear Your DNS Cache

This is another tip that may or may not work for you. Some claim it's done wonders; other say it does nothing.



Disabling Auto-tuning could speed up your network access



Also, disabling LSO can speed things up

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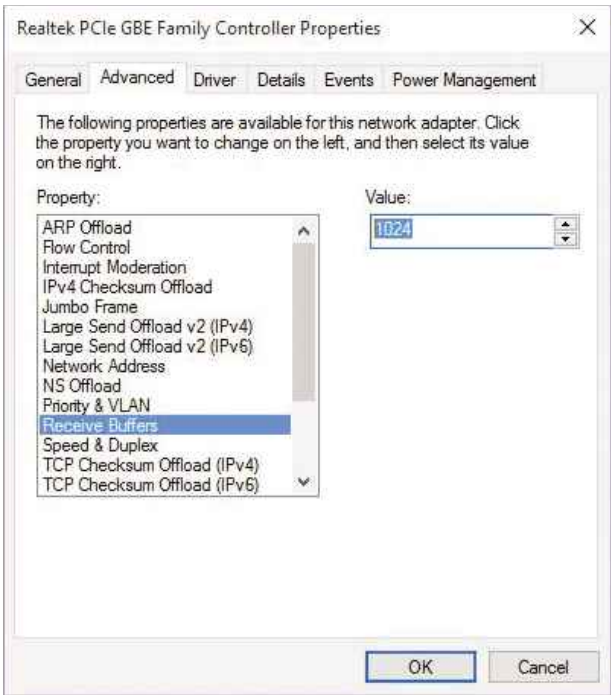
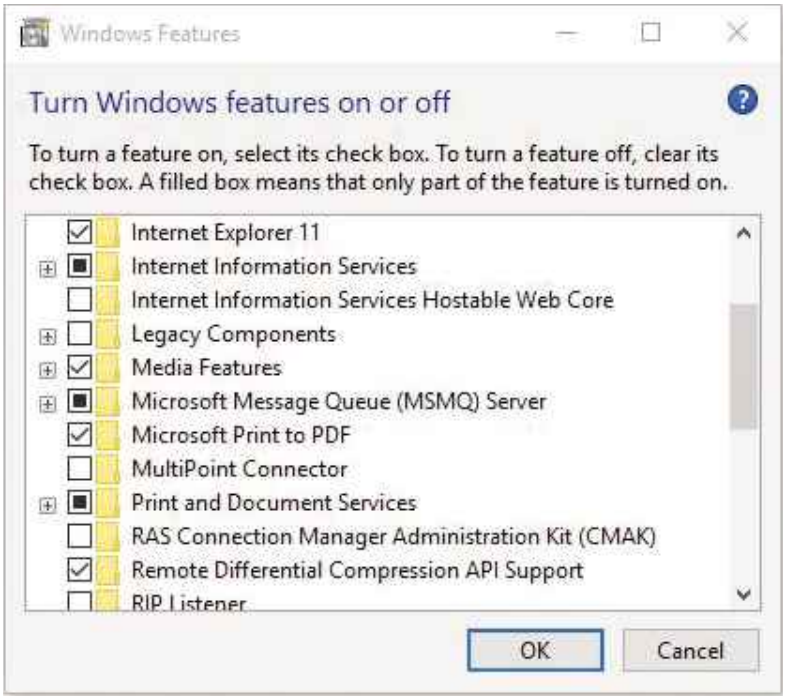


Receive Buffers may improve the speed of the data to your PC



Removing Remote Differential Compression might improve your network

The idea is to clear the DNS cache on your PC, so the next time a network request is issued it'll resolve an updated DNS entry as opposed to an older, broken one. It's a long shot, we'll grant you, but it might speed up your internal look-ups to other computers.

To clear your DNS, open an administrator command prompt and enter:

```
ipconfig /flushdns
```

Press Enter, restart your PC (although that's not always necessary), and see if there's a difference.

Conclusion

Most of the time, the best way to improve your home network speeds is to simply remove the bottlenecks of powerline adapters and wireless connectivity and run a load cables around your home, all connected to a gigabit switch.

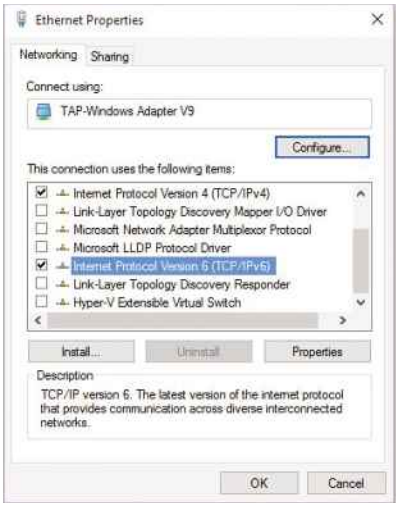
Sadly, though, that's not always practical. A network, regardless of whether it's one at home, in the office or even one that's serving several thousand machines in a skyscraper, will only be as fast as the slowest connecting component.

If you have a gigabit everything setup and you try to transfer a file from an older powerline adapter that can only handle 5Mbps, then that's as fast as you're going to get it.

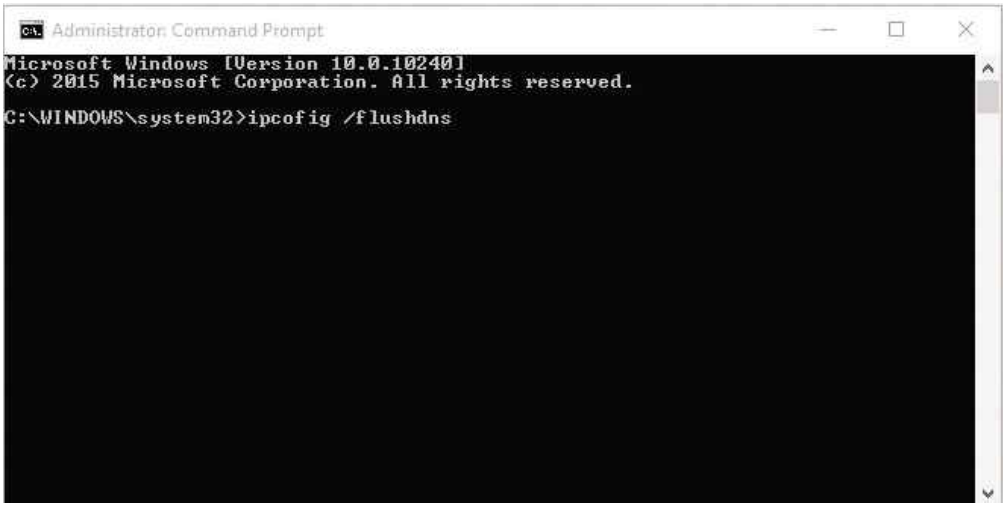
The tips regarding hardware tweaks all help, of course. Checking your cabling, making sure it's not too long and so on do actually work. The software tips are a little more hit and miss, though, with some PCs responding well to disabling Large Send Offload settings and others doing nothing whatsoever.

The trick to speeding up your home network comes from hours of experimenting with a different mix of new hardware, hardware setting and software tweaks until you get the balance that works for you and your own network.

Naturally, there are more tips to speed up your network, but this selection should at least give you a good starting point. **mm**



Disabling IPv6 sometimes works



Clearing your DNS cache can help improve network access

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The Skylake Experience

Mark Pickavance explains the subtle choices for system builders and Intel's new desktop architecture

The sixth generation of Intel's Core series processors arrived in the middle of the year, but initially with only a couple of chips. Now the floodgates have opened on the Skylake technology chips, and there are ones for almost any pocket.

To get a better handle on how this compares with the Haswell generation that many of you are using, and understand what the new chips and their chipsets offer, I set sail on a voyage of computing discovery.

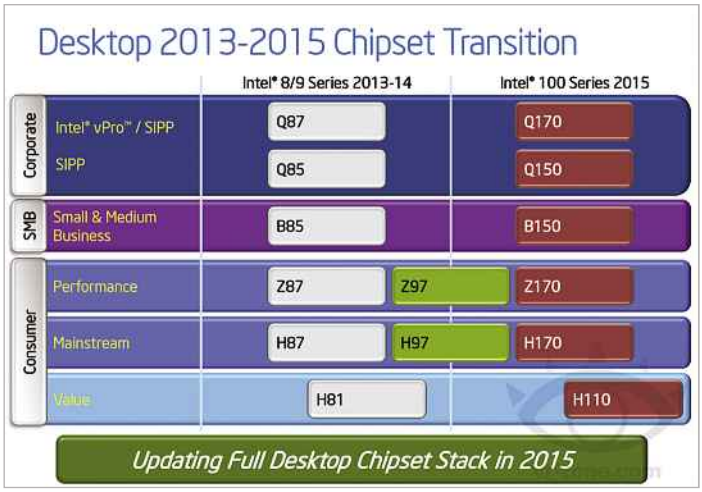
But before we get to the sandy beaches of the actual user experience, we must navigate through the choppy waters of product variations. And Intel, in its infinite wisdom hasn't made this easy navigation for even the most seasoned system builder.

Chipsets Ahoy

When I was gearing up to write this feature, I had in my mind that there was a new chip and a new chipset. Surely it couldn't be more complicated than that?

Wrong, Pickavance! It is significantly more complicated for a number of reasons, not least that Intel decided with this generation to embrace a new memory model (DDR4) and also to address some well-documented problems with the number of PCIe lanes on the previous chipset generation.

Because of this, there are no less than six chipsets to consider in Intel's 100 series family, aka Sunrise Point – three times as many as were in the series 9 family. Those are the H170, Z170, Q170, B150, Q150 and H110, and they either map to series 9 or 8 counterparts in terms of the markets they're meant to address.



This graphic shows how the older chipsets map to the new ones under Skylake. It also shows how transient Z97 and H97 were, in spite of how heavily Intel pushed them

The top of the pile and the one that most people will want is the Z170, a direct replacement for the Z97. It's important because it's the only chipset in this generation that supports overclocking, plus it has lots of USB 3.0 ports and 20 PCIe Gen 3.0 lanes.

That might seem a modest increase over the 16 lanes previously on offer, but because these are Gen 3.0 lanes there's lots more bandwidth on offer. On Z170, this allows for multiple GPU modes like x8/x8 and x8/x8/x4, but only on this chipset, since all the others can only support a single x16 video card.

The other exclusively consumer chipset is the H110, which has fewer SATA, USB and only eight Gen 2.0 PCIe lanes. It's for those system builders who want Skylake at low cost but none of the fancy features. The alternative for them is H170, a chipset that stands with a foot in both the corporate and consumer camps, having lots of ports and a decent (16 Gen 3.0) number of lanes.

The rest, Q170, B150 and Q150 are all meant for corporate use and vary their port selection and lanes accordingly. Of these, the most interesting to those who deploy business systems are the Q150 and Q170, as they both support Trusted Execution (TXT), Virtualization (VT) and Active Management (AMT). All six are compliant with Intel's Platform Trust Technology, which none of the ones they replace had.

In terms of what most Micro Mart readers are likely to buy, it's really down to Z170 or H110, depending on your budget and interest.

Knowing what chipset you might go with is fine, but now you need to look at the chips you could use on them, because there are plenty of those too.

Below is a simple overview of what each chipset offers:

All Aboard The Skylake

The timing of Skylake's arrival was all rather odd, given that just a couple of months earlier Intel had delivered the previous generation of Broadwell-DT Core chips, which were rather overdue. None of this seems optimal, and Intel only released a total of five processors for the desktop in generation, and then superseded them almost immediately with Skylake.

What Broadwell-DT did offer was socket compatibility with the Haswell chips that preceded it, where Skylake went with yet another variation, LGA 1151. Therefore the first thing to realise about Skylake is that you'll need one of the new chipset motherboard I've previously mentioned to run it.

And depending on which motherboard you buy, you also might need some new RAM, because depending on the configuration, this series can use both good old DDR3 (or DDR3L) and the new higher bandwidth DDR4 memory.

Later on in this feature I'll explore the implications of that choice, but it's another consideration to make when considering if this is the right system upgrade for you.

After some early flagship releases, Intel has now launched a full broadside of Skylake chips totalling some 14 desktop processors to choose from. You can see the range in the table on the next page.

> **"It's really down to Z170 or H110, depending on your budget and interest"**

That's lots of choice, and prices range from around £50 for the Pentium G4400 to north of £250 for the unlocked Core i7 6700K. That there isn't a super expensive chip probably hints that we'll either see a 4.4GHz flagship or Xeon model at some point in the not too distant future.

If I was building a PC for office use, I'd be especially interested in the 'T' class chips that consume only 35 watts. A dual-core processor clocked higher than 3.2GHz is going to eat most office tasks for breakfast, and yet with that level of power consumption it's also going to be a cost effective system and also very quiet.

For those who like to experiment, the new 14nm fabrication of these chips does offer significant overclocking opportunities, though you'll need an unlocked 'K' class processor and a Z170-based motherboard to achieve it.

Sunrise Point Chipsets

Chipset	Bus Interface	Link Speed[c]	PCI Express lanes	SATA 6 Gbit/s	SATAe	USB		PCIe M.2 support	TDP
						v3.0	v2.0		
H110	DMI 3.0	7.9 GB/s	6 PCIe 2.0	4 ports	None	Up to 4 ports	Up to 10 ports	None	6 W
B150			8 PCIe 3.0	6 ports	Up to 1	Up to 6 ports	Up to 12 ports		
Q150			10 PCIe 3.0			Up to 8 ports	Up to 14 ports		
H170			16 PCIe 3.0		Up to 2			Up to 2	
Q170			20 PCIe 3.0		Up to 3	Up to 10 ports		Up to 3	
Z170									

Skylake Desktop Processors												
Processor Branding & Model		Clock	CPU Turbo Clock Rate GHz			Cores (Threads)	GPU Model	Graphics Clock Rate MHz		L3 Cache	Max # of PCIe Lanes	TDP
			Single Core	Dual Core	Quad Core			Normal	Turbo			
Core i7	6700K	4.0 GHz	4.2	4.0	4.0	4 (8)	HD 530	350	350	8 MB	16	91 W
	6700	3.4 GHz	4.0	3.9	3.7					6 MB		65 W
Core i5	6600K	3.5 GHz	3.9	3.8	3.6	4 (4)						91 W
	6600	3.3 GHz										65 W
	6500	3.2 GHz	3.6	3.5	3.3				1050			
	6400	2.7 GHz	3.3	3.3	3.1				950			
Core i3	6320	3.9 GHz	N/A			2 (4)			1150	4 MB		47 W
	6300	3.8 GHz										
	6100	3.7 GHz							1050	3 MB		
	6300T	3.3 GHz							950	4 MB		35 W
	6100T	3.2 GHz								3 MB		
Pentium	G4520	3.6 GHz				2 (2)			1050			47 W
	G4500	3.5 GHz										
	G4400	3.3 GHz					HD 510		1000			

Looking at the overall specifications, there are really three levels to the chip offering, where the top two chips are really for gaming enthusiasts. Then the Core i5 is really for those looking for more computing cores, either for games or series use. And then everything below that is really aimed at business or home work platforms, for people who aren't likely to play many games or be processing HD video.

When you consider that the majority of chips are either Core i3 or Pentium class, then those are the ones Intel is likely to ship in the greatest volume and the ones that it probably makes its money on.

To avoid lining Intel's pockets any more than I'm forced by circumstances to do, I generally cap my processor investments around the £150 mark, and with Skylake I stuck to that constraint rigidly. Therefore, the best available to me was the Core i5 6500, although I was really tempted by the 6600K, if I'm honest.

Another reason for choosing the 6500 was that it matches rather closely with my current Haswell work rig, which uses the Core-i5 4430 3GHz processor, so there's some room there for a direct comparison.

But what I was more interested in was the comparison between the new chipset platforms, memory models and a Skylake processor. And, to that end I got Asus to very kindly loan me three of its new motherboards to test how they differ, both in features and in performance terms.

Platform Choices

Asus makes an amazing range of motherboards, and at the time of going to press it had no less than 47 designs that support LGA 1151 Skylake processors, excluding OEM options.

As I don't have an overclocked CPU, I avoided the exotica of its Republic of Gamers products and instead decided to source three boards that I felt Micro Mart readers might well pick, given a modest budget. The three boards I went with were the Asus Z170-P D3, its DDR4 brother the Z170-P and a micro-ATX option in the form of the H110M-A, another DRR4 design. With these I hoped to answer some basic questions about how necessary it is to move to DDR4 with Skylake, and equally do you need a Z170 chipset to get all the performance out of a Core-i5?

As I explored each platform, I also noticed a few interesting things that I want to share about them, as they each make for a system with a subtly different personality.

Let's start with the Asus Z170-P D3. It uses DDR3, so many are likely to be immediately attracted to.

Asus Z170-P D3

Street Price: £84

This was the first board I tested, so it was my first opportunity to examine the Skylake LGA 1151 processor and the new slot.

To be honest, it's no significant progression from any prior LGA design, other than it has a unique number of pins and a layout that means it won't fit in a previous socket design.

Intel is still providing the same type of cheap cooler that it's done for some time, and part of me wishes it just didn't bother. The only problem I had with this system was that the wires on

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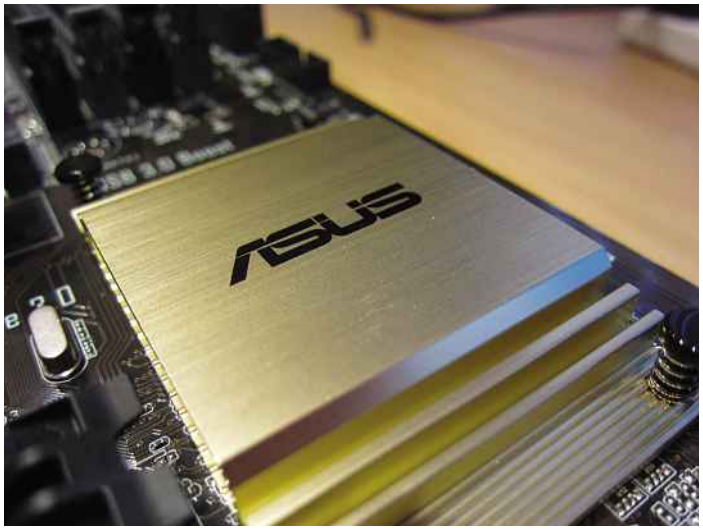


the fan stopped the blades rotating initially, because they were clipped tightly across the path of blade travel.

There isn't any way I'd deploy this as my working system with this cooler on it, frankly, but I used it for the tests, because it comes with the CPU.

For the quite reasonable cost, this board has some nice features and probably one of the best UEFI interfaces I've seen so far. Actually, this interface is on the other two boards also, but entering it for the first time, I was struck by the quality of the design work done in it.

In terms of the hardware, this design effectively exploits the Z170, providing dual x16 slots (for dual 8x CrossFire mode), four SATA-3 ports and lots of USB. But the really desirable feature is a M.2 PCIe slot that is rated to 32GB/s, should anyone ever make flash that fast.

For those not using a discrete video card, output to the HD530 integrated video is through either DVI-D or HDMI, with it being possible to have both active.

Memory support is four slots of DDR3, with a maximum capacity of 64GB and a top speed of 3100MHz if you use overclocking.

Overall, the Asus Z170-P D3 is a well-rounded design that delivers most of the things that average system builders might be looking for. And it allows you to reuse your previous system's memory, if you're looking to keep the costs of an upgrade under control.

Asus Z170-P
Street Price: £92

One the face of it, the Asus Z170-P is remarkably similar to its D3 brother, though in many respects this is a very different design with alternative memory architecture.

All the headline features of the D3 are replicated here including the special Asus 5X Protection II voltage defences. Therefore, the Z170 chipset and tweakable settings in the BIOS are partnered with a board made to handle the rigours of overclocking.

There are two major differences between this board and the DD3, each of which might tempt you to part with the roughly £8 more it costs. The minor one is that this is the first board I've seen with the new USB Type-C adapter on it, though this does reduce the number of USB 3.0 ports by two compared with the D3.

What Asus is rather subtle about is exactly which implementation of Type-C it's using, but the 5Gbps label gives away that this is running USB 3.0 through the port, not USB 3.1. As I have yet to get a USB Type-C peripheral to review, this feature is rather ahead of the game, though something we'll probably all need further down the line.

The other big change is that this is a DDR4 board, requiring those specific modules, and it has four slots that can accept a maximum of 64GB. With overclocking, these modules can run at up to 3466MHz, though for the tests I performed, mine were only rated to 2666MHz in a dual-channel configuration.

A note for system builders about these modules; they look like DDR3 but don't go into the slots as easily. Asus used slots that are anchored on one end and latched on the other. But to get the modules in, you need to slide them vertically into the slot, as the clearance is very limited and can result in what was a simple job becoming a little fiddly. Just thought I'd mention that.

In almost every other respect, this is the same as the D3, including the inclusion of the all-important M.2 interface.

One snag I ran into: when I first set up the board, I went into the BIOS and set the memory to use the XMP profile, at which point it refused to play nicely. I soon realised that the board had an early BIOS, so I upgraded to the latest release, and everything was smooth sailing from that point on.

Asus H110M-A
Street Price: £50

As Monty Python once said, now for something completely different. The point of including this board was to find out if the Z170 is really what you need to exploit a Skylake processor or will a H110 chipset do if your intentions are less ambitious?

The first thing to point out about the Asus H110M-A is that it is a micro-ATX board, so it will fit in a much smaller enclosure than the other two ATX boards. However, to get it to this size, various compromises have been made, mostly to do with the slot allocation.

There's only room for one 16x PCIe slot, no legacy PCI and the H110 chipset doesn't support the M.2. PCIe interface. There are also only two memory slots, allowing a maximum of 32GB of DDR4. That seems plenty of memory for most people, and if you've no intention of overclocking or have multiple video cards, then this feature set might be ideal for you.

My only concern is that on this design there are only two USB 3.0 ports on the rear, and you'll need to use headers to get access to more.

As it's a small board, Asus needed to save space, I assume, though that thought is somewhat contradicted by the inclusion of triple video-out. Of the three, this is the only design that includes VGA, DVI and HDMI.

For those who are curious, Asus also makes a D3 version of this board, which takes DDR3 for potentially greater cost savings, and you can buy that also for around the same price. Compared with a Z170 design you could be looking at £40 or more less, so I was interested to know how the Core-i5 6500 would perform on this compared with a more expensive board.

Time for some benchmarks, and maybe some answers.

> **To get it to this size, various compromises have been made, mostly to do with the slot allocation**

Benchmarks

Time in testing is always a compromise, because it's easy to find new things to test in alternative ways and never actually finish.

With that in mind, I chose to just focus on some simple synthetic benchmarks that tested the overall system speed, graphics capability and maths performance.

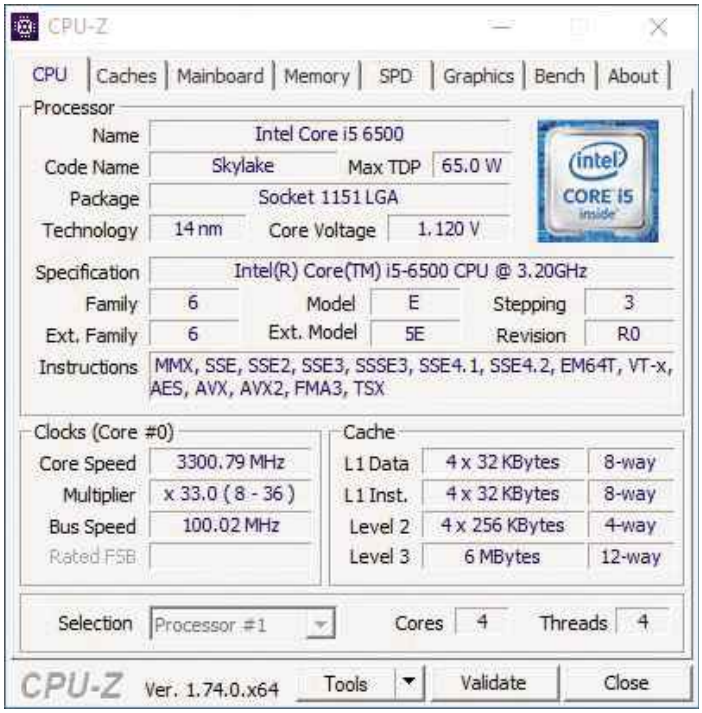
I didn't add a video card, so all the GPU testing here comes from what Intel put inside its own GPU, which lives inside the Core-i5 6500 these days.

All testing was done with the same Crucial M550 SATA SSD, and the DDR3 board used 8GB of Corsair Vengeance LP 1600MHz DDR3, and the DDR4 platforms used 8GB of Ballistix 2666Mhz modules.

All the tests were performed using Windows 10 version 10576 64-bit and an identical application load- out.

What I didn't get to explore here was power consumption because of time constraints, though on all platforms I noticed that the chip remained relatively cool while being heavily utilised. I expect that smaller CPU coolers could become the norm for Skylake systems, and water cooling is probably overkill unless you intend to overclock excessively.

The first test I performed was an old but useful test: Super Pi.



Super PI 1.5

This classic maths calculation is very good for testing a CPU's ability to crunch numbers when not using multi-thread trickery. I ran three different level of test, to make sure I didn't get any extraneous results, and the numbers were interesting.

Obviously, the first conclusion is that the DDR4 memory helps with this test, especially on the Z170-P, though the difference in speed is a maximum of 4% in favour of DDR4.

The H110M-A performed well, just beating the D3 in all of the tests, but not by the same margin as Z170-P. In all calculations, memory is involved, and it seems a reasonable conclusion that faster memory is helping speed them up.

Super Pi	1M	2M	4M
Z170-P	10.314	23.096	52.084
Z170-P D3	10.772	24.250	54.738
H110M-A	10.534	24.250	54.005

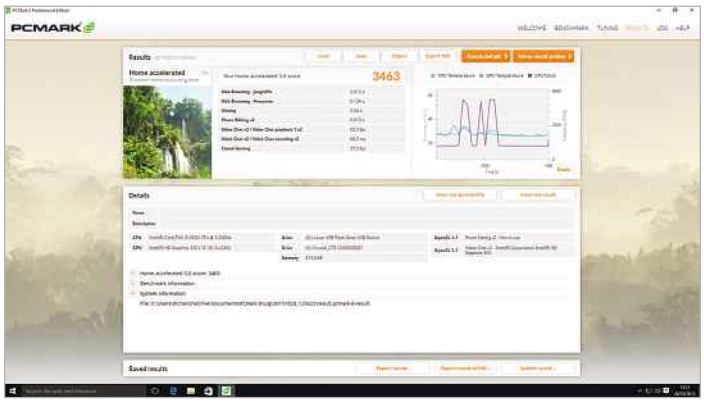
Next up is PCMark, a more general test that works out storage and GPU in addition to memory and computing power.

PCMark08 Home 3.0 Accelerated

While it might be synthetic, this is a generally good test that covers most of the typical activities that a home PC might perform.

When reading these numbers you need to keep in mind that where it's a score or frame-rate (fps), higher is better, but for time taken in seconds, less wins.

I'm not sure we learn much from the individual scores other than that the Z170 chipset is better for casual gaming, and DDR3 isn't as good for photo editing as DDR4. But what was indicated in the PI tests is replicated here to a degree, with the Z170-P being the best, H110M-A second and the D3 is bringing up the rear.



PCMark	Z170-P	Z170-P D3	H110M-A
Score	3617	3463	3582
Writing	3.37887 s	3.34422 s	3.42582 s
Video Chat encode	60 ms	66 ms	60 ms
Video Chat playback	29.99 fps	30.01 fps	30.01 fps
Web browsing – JunglePin	0.31083 s	0.31182 s	0.31166 s
Web browsing - Amazonia	0.13388 s	0.13413 s	0.13389 s
Casual Gaming	38.55 fps	37.50 fps	36.36 fps
Photo Edit	0.25847 s	0.31269 s	0.25424 s

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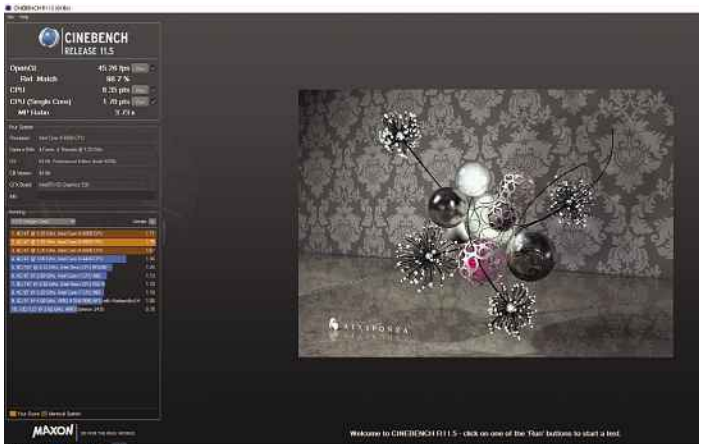


Cinebench	Z170-P	Z170-P D3	H110M-A
OpenGL	45.62 fps	42.84 fps	44.08 fps
CPU	6.35 pts	6.34 pts	6.31 pts
CPU (Single Core)	1.70 pts	1.71 pts	1.67 pts
MP Ratio	3.73 x	3.70 x	3.79 x

Again, the difference is around 4-5% between the Z170-P and the Z170-P D3, especially when confronted by more involved tasks other than just number crunching problems.

CineBench 11.5 64-Bit

This is one of the few tests that really explores what multi-threading can achieve and how efficient a chip is in using its cores.

With the same processor, and in two cases the same memory, I wasn't expecting much deviation on the scores, and to some extent that's the story here.

> **“Nobody will be buying an Intel chip and assuming that it will be the fastest choice for gaming graphics”**

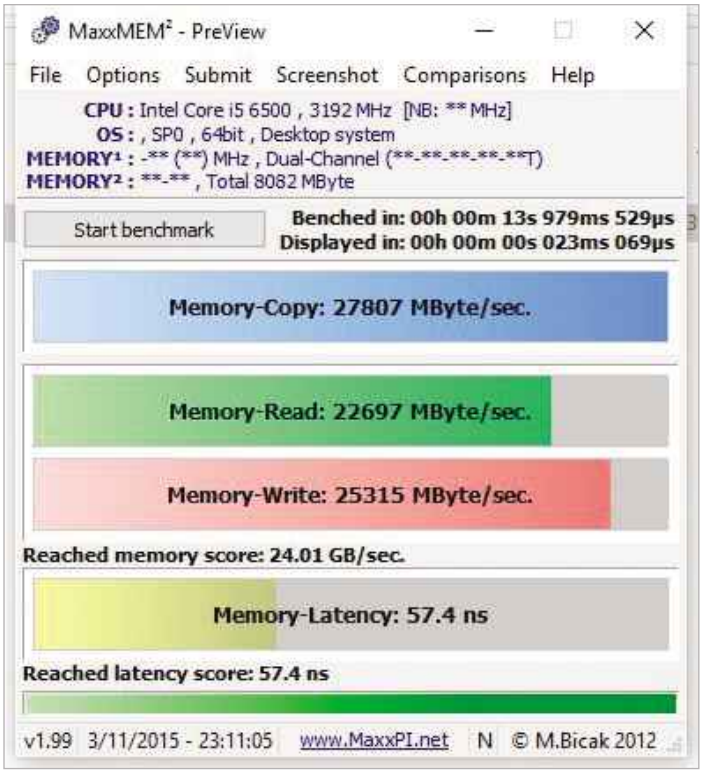
What is noticeable is that with DDR4 on its side, the GPU gets a 5-6% boost, as it's using main memory for its operations with OpenGL. It's not a huge amount, but it might make the difference between a game being playable or not. Otherwise, the differences are so small they fall generally under statistical variation for the most part.

This was the first test where the D3 actually beat the H110M-A, though not by any great margin.

MaxxMEM²

This test is designed to show what sort of memory bandwidth a system has available, so the expectation is that it will also show how much better DDR4 is compared to DDR3.

The results from this test are very odd, and I don't entirely know how to interpret them. DDR4 is meant to offer more bandwidth, and obviously does on the X170-P, but it's not significantly better on the H110M-A than the D3. And why is the latency so poor on the D3?



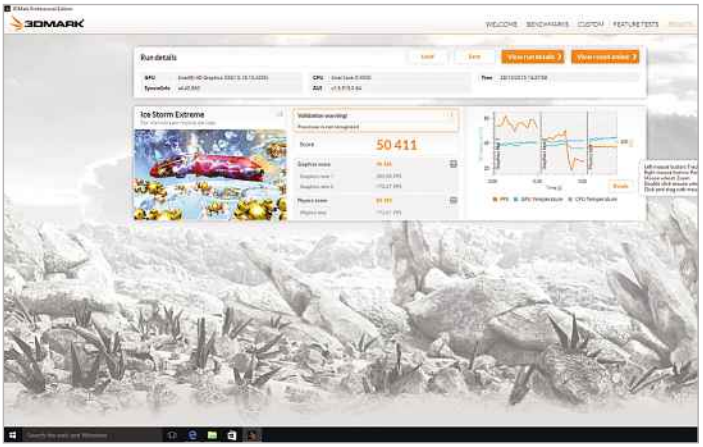
MaxxMEM² Test	Z170-P	Z170-P D3	H110M-A
Copy Mbyte/s	27807	20169	22592
Read Mbyte/s	22697	19677	19765
Write Mbyte/s	25315	22213	25679
Latency ns	57.4	65.0	68.1

I'd take these numbers with a pinch of salt, because something in Windows 10 might be messing with the scoring.

3DMark

Nobody will be buying an Intel chip and assuming that it will be the fastest choice for gaming graphics, but it's worth running this well-known benchmark to establish what the HD 530 is made of in respect of gaming potential.

These tests show the expected advantage of DDR4 on gaming benchmarks, but also that Z170 is better cut out for this job than H110.



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3DMark	Z170-P	Z170-P D3	H110M-A
Sky Diver	4223	4145	4102
Cloud Gate	7683	7591	7439
Ice Storm Extreme	49406	50411	47965

Personally, I'd ignore the Ice Storm Extreme, because it varies massively based on what background tasks Windows 10 decides to spawn while the test is running.

Sky Diver is probably the best representation, and shows that the Z170-P has the slight edge over the other options.

I didn't run Fire Strike, because on this GPU it's something of a slideshow.

Final Thoughts

Normally, each new step with Intel is about modestly increasing clock speed, as it firmly believes that its customers understand GHz, even if what a chip can achieve in a given timeframe is a much more complicated equation.

However, this exploration has revealed to me a totally new direction that Intel is heading in, and it has more to do with providing the extra PCIe lanes for rapid storage solutions to exploit.

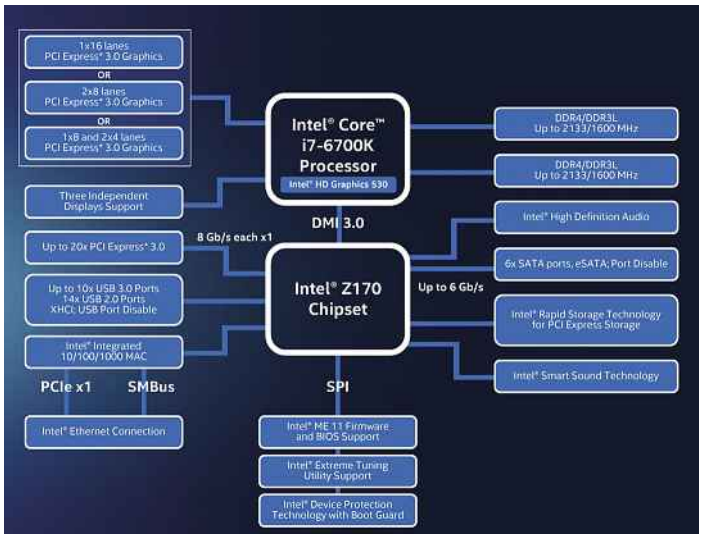
The way that Z87 was hobbled for PCIe lanes was a really short-sighted plan by Intel, even if it did help differentiate the high-end X79 and X99 products. Future PC performance will be entirely limited by the available bandwidth, as it restricts data movement between the storage, memory, GPU and CPU. And at this time, the only thing that connects all those things with lots of bandwidth is the PCIe bus. Therefore it will need more PCIe lanes, both in the support chips and in the CPU.

Because of that, I'd really recommend that whatever Skylake CPU you might choose, you go with a Z170 motherboard. And when you can afford it an M.2 PCIe drive, because the performance levels of that combination compared with a SATA SSD-based model are like chalk and cheese.

Unfortunately, I didn't have an M.2 to demonstrate this at the time I ran these tests, but I've since had the new Samsung 950 Pro, and it's a monster. Being able to read at 2,500MB/s and write at 1,500MB/s completely alters your expectations as to what your computer can do. And to do that you will need a Z170, H170 or Q170 platform.

It could be argued that if you intend not to run a discrete GPU, then you could use a H110 or one of the business chipset motherboards, and have enough lanes for M.2 PCIe handy, but Intel didn't include this feature on chipsets other than the Z170, Q170 and H170.

You can, as I've done on an older system, get a M.2 PCIe card that goes in a 4X PCIe slot, but it's never going to be as elegant a solution as mounting it directly on motherboard.



The flagship of the Sunrise Point fleet is the Z170 chipset. What's critical in this design is that the processor has 1x16 lanes PCIe 3.0 and the Z170 also has 20x PCIe 3.0 lanes. Combined, this is a vastly superior capacity than the Z97 or Z87 that came before it

That's one side of this coin, and the other is DDR4 and how the chip has been designed to best exploit it. The numbers are unambiguous: DDR4 helps, and the chip that will come after Skylake is unlikely to support DDR3.

The Crucial Ballistix Elite 8GB kit that I used for testing is a very reasonable £64.79 direct from the maker, and at that price it's certainly worth having. And those on a budget can have Crucial's 2133MHz modules for under £40 for 8GB

> **"The way that Z87 was hobbled for PCIe lanes was a really short-sighted plan by Intel"**

For those wanting 16GB, it's actually cheaper to buy a 16GB (2x 8GB) kit than to use four sticks of 4GB, and that still leaves you with two unused slots on the Z170 boards for future expansion.

As for the H110, I'd only use this with a Core i3 or Pentium class processor, because that's what it's really been built to service. You can build a system around H110 that will work fine and even use a discrete video card on it, but at some point you'll run into the limitations that Intel intentionally placed in it. Those might be the lack of PCIe lanes, USB or SATA ports.

As the lowest rung on the Skylake ladder, you could get a H110 motherboard, 8GB of DDR4 and a Pentium G4400 for less than £150. It won't run like the Core i5-6500, but it will be very quiet.

For most users, the motivation to move to Skylake will be that their existing Haswell platform is broken or doesn't have enough PCIe lanes for what they want to do with it.

For them, the Skylake CPUs and the Z170 chipset are solid choices, but for anyone with a working setup, this is a more calculated decision.

Hopefully in the next few months, I'll get to see some more 100 series boards and see how board makers develop this platform. **mm**

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TOO FAR

Mark Pickavance examines Microsoft's seemingly incomprehensible changes to OneDrive capacity

Those who use OneDrive on a regular basis got a rather unpleasant surprise the other week, when Microsoft decided to make sweeping changes to the capacity available from its service.

Before November 2015, all users with a Microsoft account got 15GB of free space, the same as Google gives to Drive users, and most got themselves another 15GB (30GB in total) by agreeing to upload all their photos from their phone or tablet.

For relatively small amounts of money, you could increase this to 100GB or 200GB, and those who used Office 365 got 'unlimited' capacity available to them.

According to Microsoft, it was the 'unlimited' aspect that caused problems, because some people took that word to represent what it does in the English language, as in 'not limited'. In the words of the Microsoft blog, "In some instances, this exceeded 75TB per user or 14,000 times the average."

That's plenty of storage space, because based on the purchase of 3TB drives, that would easily represent around £2,000 worth of hard disks. Obviously bean-counters at Microsoft had noticed this discrepancy and decided that they'd address it in a typically robust fashion.

Here are the changes as presented by Microsoft on its blog:

- *We're no longer planning to offer unlimited storage to Office 365 Home, Personal or University subscribers. Starting now, those subscriptions will include 1TB of OneDrive storage.*
- *100GB and 200GB paid plans are going away as an option for new users and will be replaced with a 50GB plan for $1.99 per month in early 2016.*
- *Free OneDrive storage will decrease from 15GB to 5GB for all users, current and new. The 15GB camera roll storage bonus will also be discontinued. These changes will start rolling out in early 2016.*

We're taking the following steps to make this transition as easy as possible for customers:

- *If you are an Office 365 consumer subscriber and have stored in excess of 1TB, you will be notified of this change and will be able to keep your increased storage for at least 12 months.*
- *If you are an Office 365 consumer subscriber and find that Office 365 no longer meets your needs, a pro-rated refund will be given.*
- *If you are using more than 5GB of free storage, you will continue to have access to all files for at least 12 months after these changes go into effect in early 2016. In addition, you can redeem a free one-year Office 365 Personal subscription (credit card required), which includes 1TB of OneDrive storage.*
- *Current customers of stand-alone OneDrive storage plans (such as a 100 or 200GB plans) are not affected by these changes.*

Predictable Reactions

If you've just read that and aren't well pleased, then you're not alone. Having highlighted the issue as a few individuals, it then somehow decided that anyone with Office 365 or who just used OneDrive for free needed to be shown no mercy either.

The scorn poured on Microsoft, especially on Twitter, was equally merciless, and many comments were too strong to publish here. One less aggressive commenter on Microsoft's own blog where it made the announcement summed up how it left many feeling: "I loved the simplicity of OneDrive, but I feel like this is a breach of trust, so I too am looking into alternatives."

If previously OneDrive was the One Place For Everything, it's now that space for a handful of photos, a couple of songs and one wedding video

"It would be more honest of Microsoft to admit that it's decided it doesn't want to be in the cloud storage business"

What confused many was that Microsoft had intentionally encouraged people to use this facility, only to seemingly pull the rug from under them once they'd committed to using it. The phrase 'bait and switch' turned up numerous times.

It was also noted that OneDrive had previously offered 7GB for free before moving up to 15GB, so it was now offering less capacity than it did in 2011. It also doesn't offer any more than 1TB whatever your needs are, even if you use OneDrive for business.

In this respect, Microsoft has effectively exited the cloud business, after issuing the excuse that people had abused a service it called 'unlimited' when nobody forced it to use this description.

At this time, we've no idea what the changes will do to the UK customers that use OneDrive, but as I recall, Microsoft never actually gave anyone outside the USA more than 1TB to begin with. It seems uncertain if the free one-year Office 365 Personal offer will extend here, as often these sorts of deals only go to American customers.

Zero Planning

I have huge difficulties with these changes, not least that I don't accept any of the reasons given for them being implemented. If Microsoft can't control a few rogue users without kicking every single other average user of their facility, then there is something seriously wrong in this company.

It would be more honest of Microsoft to admit that it's decided it doesn't want to be in the cloud storage business, instead of making up some arbitrary connection between a handful of users and the fiscal bogey man.

But beyond annoying the people it ultimately relies on to buy its products, there are wider implications to this that make little or no sense whatsoever. Since it launched Windows 8 Microsoft has been hammering home that it wants you to use OneDrive to store your personal files, providing you with a one-stop-shop for your data from whatever device you're using it.

And to drive that message it even created a video you can find on YouTube, called 'Onedrive: The One Place For Everything In Your Life'.

With the changes, you no longer even get enough space free to put your phone's camera photos up there, so that's not even close to being true.

The logic, if there is any, is that to use Windows 10 as it was intended, you'll need to either buy a service contract for 100GB or more a month, or have an Office 365 subscription if you want more space and probably better value.

And that's what's really at the heart of all this, because Microsoft would like more Office 365 subscribers and not all those annoying people who can get by with 15GB of free space.

To this writer, this change leaves its previous One Place strategy in tatters, and it needs to immediately reorganise Windows 10 so it can use any cloud service, because it clearly won't be Microsoft's that is the one being used.

What I'd really like is if Microsoft made it flexible enough to use personal cloud services on NAS devices, and then we wouldn't be stuck with buying a service if we don't need it.

As usual with this company, whatever it's up to is entirely miscommunicated or failed to be explained.

The irritation it's managed to elicit this time should have been easy to predict for anyone who has left the Redmond Campus in the last decade. The fact it wasn't (or, if it was, it just decided to take it on the chin) is probably the biggest problem facing it at this time.

If there is a workable strategy under all of this, I'll be dammed if I can follow it. **mm**

Once called SkyDrive, it is likely to be renamed GoneDrive in the near future

Remembering... Cover Media

David Hayward recalls those tapes and floppies on the front of magazines

Cover media (or covermount, as it's known in the industry) is when a magazine packages some extra form of hard media with their publication. Sometimes that media can be found on the cover of the magazine; other times it can be found hidden in a sleeve within the magazine itself. Either way, you get digital content that works alongside the content in the magazine.

From our perspective, the covermount was either a tape from 80s magazines for 8-bit computers, a floppy disk for the 16-bit home computer era, or an optical disk for more modern PCs and games consoles.

Our lasting memory started with *Crash*, around issue 65 (that's the earliest tape we own, but *Crash* did earlier tapes), when a tape suddenly appeared that contained a copy of *Dizzy – The Crash Edition*, *Micronaut One* from the ever-talented Pete Cooke, *MoonCresta*, *Sanxion*, *Wanted: Monty Mole* and a selection of pokes that could be loaded up to cheat and crack various games. It was utterly amazing, despite cover tapes being nothing new (A.C.E. magazine had been doing them since its early issues a couple of years beforehand).

After that, of course, the idea of media-loaded magazine covers took off. Floppy disks containing shareware, freeware, the first level of a game and even full programs for you to install and use were soon littering the shelves of the newsagents.

As time went on, multiple floppies started to appear, and eventually CDs were devilishly cellotaped to the cover, and removing them would rip most of the front cover in two.

Its history

According to the internet, the covermount first appeared on *Private Eye* magazine, in the form of a 7" floppy vinyl back in the 1960s.

Various audio recordings were pressed on to the flimsies, but it wasn't until the NME started to knock them out with music on the vinyl that it really took off.

Apparently, the UK was quite infamous for its use of the covermount. Other countries favoured a mixture of covermount and access to extended content via a BBS login or some form of subscription, where the tapes, disks or whatever else were sent separately from the magazine.

Obviously, the biggest flaw in delivering cover mounted media was theft. If the magazine offered an exclusive program or game, you would often find some unscrupulous individual had already flexed their thieving digits and removed the disks prior to you buying the magazine.

Did You Know?

- A.C.E. issue one had a cover tape, with the Ocean game *Gift from the Gods* on side A for the Spectrum and *Blue Max* on side B for the C64.
- The first *Crash* tape was issue 45, we think, with demos for *Driller*, *Mean Streak* and *Trantor* on one side and *Athena* and *Ikari Warriors* on the other.
- Many magazines provided the code listing on their tapes, so the reader didn't have to type in pages of BASIC or Assembly. Where's the fun in that?
- Most of the cover media from computing magazines can be found on the Internet Archive, at **goo.gl/V1uHPi**.

Cover media was also prone to the spread of viruses, long before the internet claimed that crown.

These days the covermount is still alive and well. There are a collection of computing magazines that still have a cover disc, loaded with Linux distros and so on. However, like the magazines themselves, the internet has done a fine job of slowly pushing this form of delivery from the shelves.

The Good

You got free games and programs, demos and music! You could stick some tissue in the tape write hole and use it as a normal tape.

The Bad

They didn't always work. They were mostly gone by the time you got to the newsagents. They could spread viruses and other malware.

Conclusion

Covermedia was and still is a great form of media sharing.

The many floppies of the 16-bit era, all from the cover of a magazine

Crash was our first experience with cover media

Component Watch

If you're looking for a whole heap of storage space, these deals are for you!

SSDs might be fast, but sometimes you can't beat the incredible capacity that mechanical drives now offer. If you want to get a 4TB drive to complement a smaller SSD, it's now possible to do it cheaper than ever. Don't believe us? Just take a look at some of these incredible deals we found online.

Deal 1: Seagate Expansion 4TB
RRP: £129.99 / Deal Price: £98.48

You won't find a 4TB external drive much cheaper than the Seagate Expansion (at least, not for a few months), but that doesn't mean it's any worse than the rest. Seagate is a reliable brand, and while it's an unashamedly basic unit, you do still get USB 3.0 connectivity. Great for people who want to save money and don't care about a no-frills approach.
Where to get it: Dabs – bit.ly/1WMKTtM

Deal 2: Samsung 4TB D3
RRP: £120 / Deal Price: £108.75

If you're a fan of Samsung's 1TB external drive (and let's not beat around the bush: we are), then this 4TB version is likely to be right up your street. With the same sleek, simple design and no-nonsense performance, the Samsung D3 is an ideal choice for those who like low-price, high-quality hardware. USB 3.0 connectivity is, of course, included, as well as a three-year warranty and auto-backup software.
Where to get it: Dabs – bit.ly/1Qii9or

Deal 3: Western Digital My Book 4TB
RRP: £140.14 / Deal Price: £114.99

For just a few pounds more, the equally respected Western Digital offer a 4TB drive with a whole host of extras, including WD SmartWare Pro software (for local and cloud backup) and Acronis True Image software for system level backup. There's software-based encryption and even a Windows app that helps you manage the drive and its contents. At full price it doesn't quite trounce the Seagate, but for this little difference, it's hard to argue against that.
Where to get it: Currys – bit.ly/20MqrZo

Deal 4: HGST Touro DX3 4TB
RRP: £157.25 / Deal Price: £144.42

Similar to the Western Digital My Book, the Hitachi Touro Desk DX3 has one unique feature worth mentioning: the units are stackable, so if you buy multiple drives, you can pile them on top of each other in a particularly pleasing manner. Aside from that, it's business as usual, and while Hitachi isn't a poor brand, it does lack the reputation of drive-specific manufacturers like Western Digital and Seagate. Still, at this discount, it's worth a look.
Where to get it: Saverstore – bit.ly/1Y4yq1z

Deal 5: G-Drive 4TB
RRP: £399.99 / Deal Price: £262.00

If you want something with a few more features than the average external drive, the G-Drive might fit the bill. With both USB 3.0 and FireWire interfaces and an aluminium case with integrated heatsink, the G-Drive is always cool and quiet, keeping your data safe at all times. There's no need for a fan, even though it runs full-speed 7200rpm drives, and that makes it a particularly good choice for musicians and photographers who need space to record raw images, video and audio. A three-year limited warranty only sweetens the fantastic deal on this hardware.
Where to get it: Wex – bit.ly/1Qii9or

NEWS AND VIEWS

Save Those Taped Memories With Magix

Cheap Speakers For Christmas, Sir?

Edifier has you covered

Such is the commercialisation of Christmas that the traditional stocking filler has gone up in price over the years. What once was a couple of pounds is now at least a fiver, if not more. Indeed, it may have reached the point where you'd consider throwing in some inexpensive, small speakers to score you some additional secret santa points?

Edifier has made some decent in-roads in the budget speaker market and it's at it again with its R12U model. This active 2.0 USB-powered speaker only comes with output of 2W per side, but for a modest office or bedroom setup it might just do the job fine. Don't expect anything amazing in the sound department, but it's not going to let you down if you know what to expect.

Available in Red, White or Black, these look far nicer than you'd expect for the price point and the 3.5mm aux input means connectivity is sorted while a headphone jack and on-board master volume controls complete the basic controls. The price is a mere £15 and you should visit **www.edifier.com** for further details.

Convert old to new with software

Software provider Magix is presumably bidding for the Christmas market with this one. Its Rescue Your Videotapes! software (now at version 8) has been updated in time for the festive season, so thoughts of losing those precious family memories forever need not be a worry.

The title is a little awkward, sure, but the intentions are fair enough. Magix wants to make sure that your personal VHS videos can be preserved in a digital format forever and Rescue Your Videotapes! is a complete package that will back up recordings to a PC, DVD or Blu-ray in a few steps using the included USB video converter and Video easy HD software. Everything is included here, so there is no prior knowledge or additional hardware needed to get started as the software wizard will guide you through entire process.

You can also edit soundtracks, add text and 3D transitions and throw in some camera tracking shots for good measure – this one promises the whole shebang, even correction of shaky video footage.

It'll set you back £45 and you can buy it over at **www.magix.com**.

Feel Hannspree's Pulse

New smartwatch from electronics outfit

Hannspree is pushing the latest in its wearable devices range, the Pulse. It's a smartwatch that comes loaded with a fair bit of functionality, the kind of which you'd expect to find in wearables these days. So here we have a touchscreen IPS display, heart rate monitor stopwatch, info on calorie consumption and a pedometer, sleep monitoring, email, SMS and a voice recorder.

You can pair the Pulse with a smartphone via Bluetooth, which also gives access to saved playlists in your smartphone's music library. The watch itself isn't too bad to look at either, featuring an all-metal frame made of stainless steel with a back strap made from hypoallergenic calfskin leather. The screen's round design includes that aforementioned IPS display for super-wide viewing angles and the high-def TFT screen is said to be clear and bright in all lighting conditions, which is exactly what a watch will have to deal with.

With two days standard use from a single charge, battery life is hardly outstanding, but it only takes a couple of hours to get fully charged again. So, for the £89 price, it's another interesting entry into the vast swathe of budget-end wearables out there. Head over to **www.hannspree.co.uk** for more.

If someone leaves you with a cake and says you can have as much as you like, there's nothing to say you can't just eat it all. While most of us know it's polite to have only one or two slices and leave the rest, there will always be that one person who takes the whole lot and then shoves the plate up their jumper too.

This is a fact that Microsoft should have been more aware of, because it's something the firm is claiming to have fallen victim to. Instead of cake, though, it was offering the general public unlimited cloud storage. What could possibly go wrong?

Well, apparently, a number of users took Microsoft up on its offer and started uploading huge amounts of data – up to 75TB in one case. Just like the person caught with cake crumbs on their lips and an empty plate, these users knew they were taking the micky.

But they can't really be blamed. Broadband providers and mobile network companies have already had to deal with the fallout from 'unlimited' offers, so surely Microsoft should have known what a bad idea it was to offer this. It didn't, though, and now it's had to backtrack and make cuts to its packages.

Of course, there are still a few firms offering unlimited storage, and it'll be interesting to see if they'll follow Microsoft's example.

Anthony

Editor

Meanwhile... On The Internet...

With UK politicians preparing to debate the new Investigatory Powers Bill, which could bring in a new laws designed to simultaneously extend and regulate digital surveillance, the issues of encryption and the the extent to which the powers-that-be should can delve into our online lives is very much under the spotlight. While the initial raft of news stories regarding the bill largely focused – as we did – on the proposal to compel ISPs to records of the sites we've visited for a year after the fact (though not the actual pages we've looked at), as people have delved deeper into the proposals **(tinyurl.com/MMnet89a**) they are finding things buried deeper with it, that aren't being reported as widely.

Take the recent *Ars Technica* story on the wonderfully dull-sounding "technical capability notice" (**tinyurl.com/MMnet89b**) section of the legislation – aka Section 189. This, it tells us, could afford the Home Secretary the power to impose "an obligation on any relevant operators" if he or she considers it "reasonable to do so", and that is "practicable for those relevant operators to comply". Translated it means, were Theresa May to be allowed to wield these powers now, she could compel technology companies to provide any service or level of access that authorities deemed necessary. That, we're told, could include providing backdoors into software.

While it may fall short of company's to be capable of breaking end-to-end encryption, it would give authorities much more power than is available now, at the whim of a politician – and there is no time limit on the legislation, so it wouldn't lapse. What's more, it would be illegal for anyone to reveal or discuss the existence of any backdoors or exploits in public, and doing so could be punished with a 12 month prison sentence.

So, not only would companies and individuals be gagged from talking about backdoors and exploits provided under the legislation, it would also be illegal for them to talk about any measures taken by authorities under the auspices of the bill.So, while the legislation purports to build extra safeguards in terms of what data can be collected and under what circumstances, it could make scrutinising what is collected almost impossible, because such secrecy orders would make talking about it – even in court – illegal.

As *Ars*' Glyn Moody puts it, it would "make it impossible for anyone in the know to discuss any details of the government's surveillance activities, ever." Or, as the *Conspicuous Chatter* blog says: "it will result in, and perhaps intends, closing for ever the democratic debate about what constitutes acceptable state surveillance." (**tinyurl.com/MMnet89c**).

Frankly, it's no wonder there's big money on the table for anyone who can crack the Tor network and reveal its users (**tinyurl.com/MMnet89d**), and that those behind Tor think the FBI is paying University researchers to attack it (**tinyurl.com/MMnet89e**).

It's been a musical week online, all told. Firstly, on the other side of the Atlantic, YouTube was busy launching it's YouTube Music app to generally postive responses (**tinyurl.com/MMnet89f**). Designed to leverage the site's popular status among artists and labels and its massive user base in order to take on the streaming music market, it even provides offline and video-free services for subscribers to the also-brand-new-over-there YouTube Red premium service. When either of these services will make it over here is not clear at present, but we'll certainly be taking a look at them when they do.

Almost simultaneously, Apple Music finally made it's way on to Android phones in an attempt to boost its user base, which currently sits at 15m people. That may sound a lot, but it's pretty low compared to Spotify's current user base of 75m and the 1bn people who watch YouTube (**tinyurl.com/MMnet89g**).

While these numbers may lead you to think that the future of music is digital, there came a stark statement from Geoff Taylor of the BPI, the industry body representing UK record labels. He told the Music Futures conference that revenues from sales of vinyl made his members more money than the "14bn music streams on YouTube" in 2014 – a year when over 1.3m vinyl records were sold, making labels £12.1m (**tinyurl.com/MMnet89h**).

As regular readers will know, we like a good social media fail in these parts, and this one of the doozies that is as understandable as it is cringeworthy. For, if you do not follow cricket, you may be forgiven for not knowing the name Sachin Tendulkar – the problem is that, if you do (or you are from the Indian subcontinent, or have any connection to it), it's one of the most famous names in the world.

You can, therefore, imagine the response from the former Indian captain's legion of adoring fans when a representative of British Airways responded to a complaint from his **@sachin_rt** Twitter handle with a cookie-cutter response asking for his full name and details (**tinyurl.com/MMnet89i**). If only they'd noticed the complaint was coming from a man with 8.4m followers.

There's no real reason for the picture of Shia LaBeouf below, other than the fact that, after spending a chunk of last week watching him wither during a 72-hour marathon of his own films, we quite miss him (**tinyurl.com/MMnet89j**).

.AVWhy?

Videos For Your Eyes... Not Necessarily For Your Brain

In the busy, hulaballoo of the world we live in it's easy to forget the simple pleasures: a sunny day in the park, pancakes with sugar and lemon, the sound of leather on willow, flicking dew off spiders webs and the dubbing of comic voices over video of cute furry animals. It's great then, that we have the YouTubers of The Daily Share to remind us of the last of those, at least, with a great little clip featuring two guinea pigs discussing the seasonal trend for pumpkin spice (**tinyurl.com/MMnet89k**).

QUICK BITS... Facebook has, on average, more than a billion users every day, according to its latest quarterly results

Caption Competition

Let's see what funnies you came up with for this little fella, eh?

- **FreakShow!**: "One way to minimise your data usage."
- **doctoryorkie:** "Nice pad."
- **doctoryorkie:**"Get Windows 10? I smell a rat."
- **Think Tank:** "Don't fall asleep at the wheel."
- **JayCeeDee:**"Dammit - someone said 'Cheese!', but it was only for a stupid Selfie."
- **JayCeeDee:**"Trying to stream the Disney Channel - it's cheaper than Skyping for keeping in touch with the relatives."
- **JayCeeDee:**"Those Tom and Jerry re-runs are getting harder to find!"
- **FreakShow!:** "Look out Mousey! It's a trap!"
- **wyliecoyoteuk:** "Where's the squeaky key?"
- **pesukarhu:** "The trainee web-designer completely misunderstood the concept of a mouse-over!"
- **Thomas Turnbull:** "I ordered this rat pack from B&Q."
- **Thomas Turnbull:** "Ha! I've hacked into the Pied Piper's Computer and wiped his client file."
- **Lionel Gower:** "So what do mice do when they're at home? MouseWork."
- **Jack Gold:** "So where's the cheese?"

The winner, though, was ZX81 with "We now know who named a byte, bit and nibble!", which was pretty much perfect by our reckoning.

To enter this week, come up with something to accompany the picture below, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**), or email us your funnies via **caption@micromart.co.uk**, remembering to add the issue number to the email subject line. Cheers!

TalkTalk Hack Not As Bad As Feared

Only 157,000 affected. Only!

And so the TalkTalk hack attack came and went and amid all the TV coverage and newspaper reports denouncing TalkTalk for its failures, the people affected by the matter had to try to carry on as normal in the knowledge that their details were out in the wild.

Well, the company has since confirmed the numbers affected by this unsavoury episode and it turns out that around 157,000 customers were actually caught up in the whole nasty affair, with TalkTalk stating that all customers should maintain vigilance in monitoring their bank accounts.

With just four percent of customers having had their sensitive data put at risk, according the company, the problem would appear to not have been as widespread as first feared.

BBC Store Open For Business

How has this not happened until now?

The BBC has launched its BBC Store (currently in beta) giving willing punters the chance to buy digital versions of its past and present output. That accounts for over 7,000 hours of television that's available to download for keeps.

Of course, the Beeb's iPlayer already allows downloads for a limited period, but now consumers can forever own BBC content without having to dig out a physical format of the shows involved. Costing under £2 an episode, it's competitive with Apple's iTunes and it's perhaps most interesting for tracking down some of the BBC's older, classic output – including some banned programmes, no less. The BBC's current deals with Netflix and the like won't be affected, as the service will run alongside them.

Given the timing, we imagine that this will do big business in the run-up to Santa's busiest day of the year. Sign up now as get 25% off your first purchase too as an introductory offer, using the code WELCOME25.

Snippets!

Twitter Switch

In a move that, frankly, caused far too much of a furore among users, Twitter has replaced its 'favourites' system with a 'likes' one, replacing the Star symbol with a Heart. Why the change? Well, it said that the star can be confusing for some – really? – and that the heart symbol is universally understood. Cue much moaning among many, many tweeters.

Facebook Launches Music Stories For iOS

Facebook has expanded its range of services once more to give users a chance to post the first snippet of a song to share among friends – but only if you're an iOS user. Music Stories previews the first 30 seconds of a song by streaming via Spotify or Apple Music, with users then being able to link through to buy that track. This is significant in that it means people can stick to Facebook when sharing music they like, keeping people within its ecosystem.

Just shows the importance of social media in the music business these days.

Black Friday Biggest Day For Online Stores

According to a bit of research from digital market intelligence firm SimilarWeb, Black Friday is the single biggest day for online traffic to UK retailers.

Black Friday used to be an American tradition, but the UK has recently followed suit and last year led to a recorded 14% rise in online traffic, boosting the revenues for the likes of John Lewis. According to the report, the five "Mega Shopping Days" leading to one-day retail spikes are Black Friday, Thanksgiving, Cyber Money, Christmas Day and Boxing Day.

Christmas Day? Shouldn't people be enjoying some quality family time?

Broadband Pledge By Government

Internet access not a "luxury"

David Cameron has spoken of how 2020 is going to be a big date, for this is the day that all homes and businesses will finally have access to what is being defined as "fast broadband".

The government is bringing in a "universal service obligation" in relation to broadband that will allow the public to exercise a legal right to have access to an "affordable" broadband connection. The idea, then, is broadly to view broadband provision in the same way as people view utilities – something Mr Cameron alluded to in a speech on the matter.

The big problem with this whole notion, noble though it is, is that the government's 2015 target of the UK having the best superfast broadband in Europe has failed to come to pass. The UK's broadband is, broadly speaking, pretty good but the digital divide still exists and, to be frank, 2020 is not a long way away. Interestingly, this new announcement also assumes that 10Mb/s is a speed that we should all be aspiring to, when most ultra-fast users will tell you it's nowhere near enough in these enlightened times.

Will 10Mb/s be viewed as slow-paced as dial-up in five years' time? Can the government really promise that the far-flung places in the UK will be provided for under this pledge? How much is all this going to cost and who is going to be expected to pay for it? Will the government actually achieve its goal this time round? Lots to chew over.

Facebook Moaning Lands Juror In Hot Water

$1,000 fine for ill-timed typing

If ever there was a case for thinking before you type, this is it. The *New York Daily News* has reported on a legal trial taking place across the pond concerning a robbery in New York. We thought it was fairly common knowledge that what goes in the courtroom stays in the courtroom. Indeed, the judge had ordered the 12 good men and true not to divulge any of the information on the case to the outside world.

For first-time juror Kimberly Ellis, the warning didn't work. Ellis wrote on her Facebook page in September this year "Everything about this process is inefficient. I'm trying to remain positive and centered, but, truthfully, I'm dying from boredom." She followed up during the deliberations process with "God help me. The other jurors don't trust the police and want to outright dismiss the confessions as well as the majority of the rest of the evidence. Tomorrow is going to be a very difficult day."

When news of the postings came to light, Ellis was always go to be in trouble. She apologised, saying that she forgot that Facebook was so public, but that didn't work. According to the report, she was held in contempt of court and fined $1,000. More seriously, the whole proceeding was declared a mistrial by the judge.

QUICK BITS... **Snapchat's become rather popular too. The number of daily video views on the site**

Smartphone Apps Leaking Data

Apple or Android; nobody's safe

Research from America's MIT, Harvard and Carnegie-Mellon universities has revealed that apps released on Android and Apple smartphones are sharing lots of data on their user's and their activities.

In a study of 110 apps that can be bought on Google Play and Apple's App Store – 55 were tested on each platform – the researchers found that 73% of Android apps share users' email addresses and 47% of iOS apps share location data with third parties.

The researchers looked at the HTTP and HTTPS traffic when using the apps and, given that some of this data is naturally potentially sensitive, it sounds as though this is something we should all think about when using our mobile apps.

The trouble is, of course, knowing which apps you can trust and which you can't.

Stock Manipulator Indicted

Twitter tampering only made him £60

An interesting legal case in the States has led to the indictment of 62-year-old Scotsman James Alan Craig for manipulating stock prices using Twitter.

It went something like this: Craig created a couple of Twitter accounts that appeared to the layman to be related to securities research firms, then tweeted from those accounts false information on publicly-traded stocks on Twitter. That information led to a dip in stock prices on some companies, which he then allegedly traded on in order to make himself some money. Was it worth it? No. While the US justice department claimed that the tweets cost shareholders around $1.5m in losses, Craig only made around $100 from the exercise as he waited too long to trade the stock, according to the SEC filing on the case. Plus, he's in a whole lot of legal trouble following his indictment in California.

Unleash Your Inner Adventurer

Play Uncharted for real

This sounds fun. Three UK and Sony Xperia Z5 have launched a real-life *Uncharted* adventure taking place through the streets of our fair capital. The London-based geo-tagging adventure uses voice messages from Nathan Drake himself – well, the actor Nolan North who voices him in the franchise – that have been 'dropped' in locations across the capital for keen participants to find on their smartphones. The messages are playable thanks to sound-tagging smartphone app, Recho, and each one gives clues on where to find the next recording and continue with your hunt.

The messages refer back to events from the first three games in the series, and there's something in it for anyone who makes their way to the final location. The first person to successfully complete the challenge will be handed a Sony PS4 console – but everyone else will be in with a chance to win something, with prizes including the new Sony Z5 handset, pre-loaded PAYG SIMs, and copies of the *Uncharted: The Nathan Drake Collection* game. The rules state that prizes will be handed out on a first-come, first-served basis, so you'd better get moving – if it's not to late!

This is all live now so head over to the Three blog at **blog.three.co.uk** to be guided on how to take part. Hurry, if you're interested, as the whole challenge will wind up at midday on 5th December! Go go go!

now stands at six billion – that's triple the daily views from May

Asus ZenPad S 8.0 Z580CA

An 8" tablet that easily holds its own against the competition

DETAILS
- **Price: ~£200**
- **Manufacturer: Asus**
- **Website: goo.gl/1bHQx1**
- **Requirements: Google account, micro-SD card for extra storage**

The Asus ZenPad S 8.0 Z580CA is a great looking tablet

But it also has some excellent specifications to its name

There seems to be have been a slight shift in the tablet industry of late. Where once 'the bigger the tablet the better' was very much the slogan, these days users seem to want a more manageable and slimline approach to their device.

As such, there's now a wealth 8" tablets to chose from, for example the Sony Xperia, Samsung Galaxy Tab S 8.4 or even the Apple iPad Mini 4. Yes, the era of the smaller tablet is upon us.

Trying to compete with that little lot is no joke, but Asus may have an ace up its sleeve in the form of the ZenPad S 8.0 Z580CA. This wonderfully presented 8" Android tablet has some pretty remarkable features within its 203 x 134 x 6.6mm body. Powering it all you'll find an Intel Atom Z3560 quad core, 64-bit processor running at 1.83GHz (boost to 2.33GHz), with 2GB of memory and 32GB of storage. The GPU is an IMG PowerVR Series 6, which drives a rather splendid LED backlight, QXGA IPS panel that can display an impressive resolution of 1536 x 2048. What's more, said screen is coated in an anti-fingerprint layer and has active pen support and Asus Tru2Life+ technology.

There's a 5MP camera to the front of the tablet, with an 8MP camera at the rear. Both take excellent images and videos with various touch-up elements and beautification settings to apply after the fact. Video can be shot at resolutions up to full HD, while also offering various enhancements.

It's an extremely lightweight tablet, weighing just 298g, which makes it easy to use as an e-reader as well as a device you can happily chuck in your back- or coat pocket without it causing too much discomfort. Thanks also to the fact that it's just 6.6mm thick, you can easily get away with holding it by your fingertips for quite some time before you'll need to change hands.

Finally, the Z580CA has Bluetooth 4.1, 802.11 a/b/g/n/ac and support Miracast, and you'll find a USB type-C port, two-in-one audio jack and a micro-SD card slot with support for up to 64GB cards.

Out of the box it runs Android 5.0, with a brief selection of Asus led apps pre-installed. The Asus apps consist of various productivity tools, Amazon Kindle, Trip Advisor and a launcher to Ludigames. Naturally, there's the usual Google Play Store, and you also get three specific ZenPad apps that allow you to connect to a PC or to the tablet remotely. While they're okay, more importantly they don't get in the way of personalising the choice of apps yourself.

To test the overall performance it could produce, we ran Geekbench 3. That came back with a single core score of 770 and a multi-core score of 2354 – both of which are pretty good numbers and show that the ZenPad S 8.0 Z580CA is more than capable of running the most performance hungry apps and games you care to throw at it without too much difficulty.

The price of the Asus ZenPad S 8.0 Z580CA isn't too bad either. Considering you're getting a beautifully presented and well-specified tablet, we think the asking price of around £200 is very reasonable. It is, after all, an excellent piece of kit that performs exceptionally well, is light, has an amazing display.

mm David Hayward

An excellent value tablet, with great performance and style

Edifier Prisma Encore

Michael Fereday takes a look at a 2:1 Bluetooth speaker system

DETAILS
- Price: £129.99
- Manufacturer: Edifier
- Website: www.edifier.com
- Requirements: n.a.

I have to admit to have somewhat of a soft spot for the various speaker products developed by Edifier. Even before unwrapping the packaging, my mind goes into overdrive as I try to guess what unusual shape the company will have opted for the design of its next speaker. In the case of the Bluetooth-enabled Edifier Prisma Encore, a 2:1 speaker system, the company has gone for an ancient helmet look for the sub-woofer, while the accompanying satellite speakers are of a triangular pillar design that is narrower at the top than the base.

Impressively packaged in a sturdy box, this system comes with a host of accessories and leads. Along with the two-piece power lead, you get a 3.5mm to 3.5mm jack audio lead, jack to dual phono plug lead, remote control unit powered by a CR2025 lithium button battery and a cleaning cloth to remove any finger smears that can deface the lacquered faces on the sub-woofer and satellite speakers. The actual connecting leads between the sub-woofer and satellites are permanently attached to the speaker units.

With an audio output of 40W, the sub-woofer's helmet shape has a black lacquered front panel that looks great straight out of the box and when handled with care, but which can quickly display the evidence of wandering fingers. Connections on the rear of the unit allow the two satellites to be linked along with mains power and an auxiliary device that does not possess Bluetooth support. Positioned on the crown of the helmet are touch-sensitive controls for those occasions when the remote goes AWOL plus a status light. Lurking inside the sub-woofer is a downward firing 5" driver delivering the audio output.

As with the sub, the black satellite speakers have lacquered areas running down either side of each speaker unit. Separating the lacquered panels is a cloth covered third panel. Each satellite features a 3" midrange driver and a ¾" silk-dome tweeter that combine to deliver an audio output of 12W.

As mentioned earlier, the Prisma Encore supports Bluetooth connectivity. In order to activate this feature prior to instigating a pairing procedure, you will need to use the remote control unit by holding down its Bluetooth button until the status light on the sub-woofer turns blue. You can then pair a smartphone or tablet to the Prisma Encore in the normal fashion. With non-Bluetooth connectivity providing the audio output, the status light will glow green.

Most owners of products of this type tend to position the sub-woofer where it is less likely to cause an obstruction. However some care does need to be taken with the Prisma Encore as the remote control requires a direct line-of-sight with the sub-woofer in order to work. By using the remote you can control this sound system from the comfort of an armchair and also reduce the build up of finger smears on those polished surfaces.

mm Michael Fereday

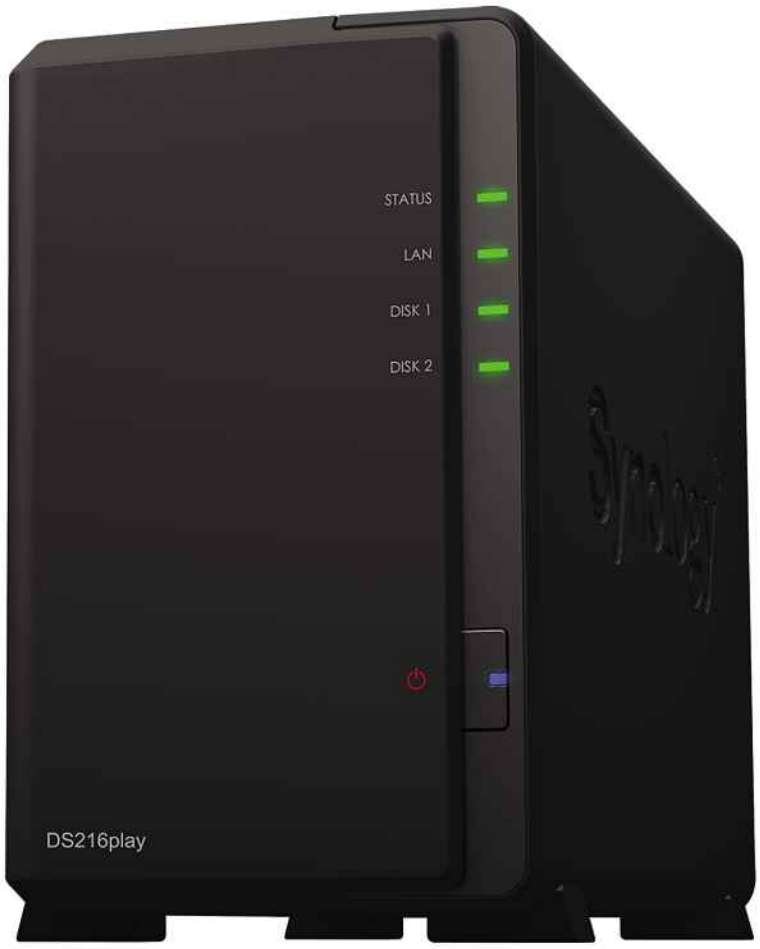
Edifier Prisma Encore 2:1 Speaker System	
Power Output	RMS 12W x 2 + 40W
Signal to noise ratio	>85dBA
Frequency response	65Hz~20KHz (+/-6dB)
Input type	Bluetooth / AUX
Input sensitivity	R/L:500mV+50mV
Bass unit	5 inch
Mid-range unit	3 inch (78mm)
Treble unit	¾ inch silk dome

A reasonable speaker system with a distinctive shape

Synology DS216Play

Synology's new 'Play' brings even more decoding options to those that need them

DETAILS
- **Price: £186 (no drives)**
- **Manufacturer: Synology**
- **Website: tinyurl.com/nq9mcr5**
- **Requirements: Wired network, Broadband router, video playback devices**



Synology first launched a 'Play' model back in their x14 series, it was a dual drive NAS box that used the Intel Atom CE5335mm – the same chip that ended up in its four-drive DS415Play a year later.

Their new DS216Play goes back to the dual drive format, but ditches the Intel chip for a pure ARM SoC, in the form of the STM STiH412. That's a very impressive piece of silicon, and here Synology gave it 1GB of DDR3 to help run the dual drive enclosure, which can take up to 16TB of storage when loaded with 8TB drives.

An early disappointment with this design, though, is the lowered build quality. The DS216Play borrows from the simple construction of the 'J' and 'SE' lines, foregoing the tool free installation used in the DS214Play predecessor. What's more, those ideas you had about upgrading the RAM are toast, because the DDR3 is not socketed, sadly. My only other hardware-related moan is that Synology only gave the DS216Play two USB ports, of which only one is USB 3.0. That's not enough, I'd suggest.

What's good here, however, is how quick the DS216Play is to set up once the drives are installed. The system defaults to its own Hybrid NAS layout that is effectively RAID 1 with two mechanisms.

Synology quote 107MB/s reading and 91MB/s writing, though I never got quite that high for reading while using the dual Western Digital 2TB Reds we employed for the purposes of this review. However, compared with cheaper NAS boxes it is very rapid and ideal for the majority of home users.

What's critical to understand about this hardware is that it isn't a general purpose NAS box. Yet it performs all the same duties that all dual drive Synology NAS offer through the

DS216play Main Specifications

CPU Model: STM STiH412
CPU Frequency: Dual Core 1.5GHz
Hardware Transcoding Engine: H.265 (HEVC), MPEG-4 Part 2, MPEG-2, VC-1,
Maximum resolution: 4K (3840 x 2160), **Max FPS:** 30
System Memory: 1GB DDR3
Drive Bays: 2x
Compatible Drive Types: 3.5" SATA III / SATA II HDD, 2.5" SATA III / SATA II HDD, 2.5" SATA III / SATA II SSD
Maximum Capacity: 16 TB (8 TB HDD X 2) (Capacity may vary by RAID types)
Maximum Single Volume Size: 16 TB
External Ports: 1x USB 2.0 Port, 1x USB 3.0 Port
Size (Height X Width X Depth): 165 mm X 100 mm X 225.5 mm
Weight: 0.88 kg

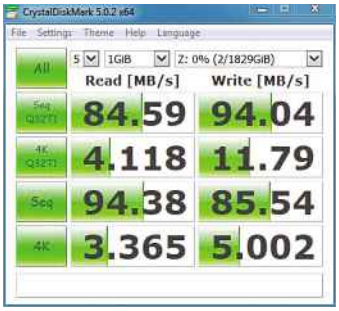
impressive array of installable software modules.

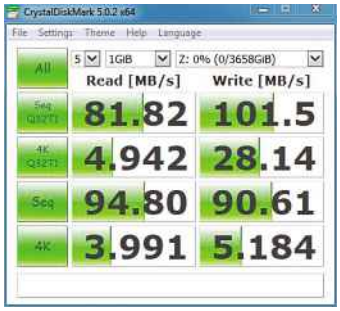
The designers used the STM STiH412 to power this unit because it was built with a specific purpose: to provide real time transcoding of up to 4K video in real time. The chip might only have dual cores running at 1.5GHz, but the hardware decoding/transcoding engine can handle H.265 (HEVC), MPEG-4 Part 2, MPEG-2, VC-1, with a maximum resolution of 3840 x 2160 at 30 fps.

Okay, there are some limitations, such as the fact it can only decode one 4K stream at a time – though it can work three 1080p resolution ones simultaneously. Where some users might get moderately confused, however, is that it doesn't transcode for DLNA connected devices. It will do it very nicely for those that are using a web interface or one of Synology's mobile apps, however.

More of an issue are the two significant flaws I've noticed in all of this functionality, one of which – DTS audio – has been a bugbear for a while.

I don't want to get into the ethics of movie copies, but many people have made or acquired copies of Blu-ray





media that includes DTS or Dolby Audio tracks. There was a previous time that DTS audio worked through Video Station, but Synology decided not to license it, and since then unless your player can handle DTS you won't get any sound. Not even stereo.

That's not a problem if you are using DLNA to a device with DTS support, like the WD TV Live, but it won't generally work streaming to a mobile phone.

The other issue is the lack of support for HEVC Main10 standard. As this might become the codec of choice in years to come, that could be a problem. Regrettably, it can't handle 10-bit deep h.264 or h.265 either. The only advice I can reasonably give here is that you should make sure that this will work with the hardware and media you've got before investing.

In the right circumstances, the DS216Play is an unassuming box that can do some remarkable video tricks. You can even plug a USB TV decoder, like the DVBLink TV Server, and turn the DS216Play into a full blown PVR, and for those with an Apple TV, Roku, Chromecast or Samsung Smart TV, you're well supported for video and audio streaming.

The DS216Play is essentially a very impressive technical achievement that is keenly priced for its capabilities. However, for serious video enthusiasts there are some wrinkles that need to be ironed out for it to win their approval.

mm Mark Pickavance

"Make sure that this will work with the hardware and media you've got"

A fast NAS box with a special video transcoding CPU

Asus M52AD-Xtreme

Interested in a higher-performing family PC?

DETAILS
- **Price: ~£920**
- **Manufacturer: Asus**
- **Website: goo.gl/MRCLUQ**
- **Requirements: Keyboard, system comes with a USB mouse, monitor**

▲ *The Asus M52AD-Xtreme is certainly a tidy looking PC*

Rather than specifically targeting a certain market sector, Asus has attempted to cover all the bases with the M52AS-Xtreme system. Here is a PC that is advertised as the 'Power Hub for Work and Play'; one that can comfortably cater for the gamer, student, home worker or just the everyday computing needs of a family.

It manages to do a decent enough job of it too, thanks in part to the Core i5-4460 processor, running at 3.2GHz, 8GB of 1600MHz memory and large 2TB SATA III hard drive. Upon this, you'll find a copy of Windows 8.1 – upgraded to Windows 10 – pre-installed along with a collection of Asus specific programs and tools.

Asus has also installed an Nvidia GTX745 graphics card, with 4GB of memory, an 802.11 a/b/g/n/ac wi-fi card with separate low-profile antenna, a six-in-one card reader and a DVD-RW optical drive for good measure. It's a good mix for a family PC, and with the combination of GPU, CPU and the amount of memory, there's probably enough performance to keep all members of the family reasonably happy.

Connectivity on the M52AD-Xtreme is certainly enough for most users, with HDMI, DVI and VGA from the rear of the GTX745, and three USB 2.0 ports along with an impressive six-port audio block from the rear of the motherboard (with further HDMI and VGA, but blocked due to the presence of the GPU).

The front of the case houses the multi-card reader as well as a further two USB 2.0 and two USB 3.0 ports, with headphone and microphone ports finishing the connectivity off nicely.

In terms of performance the Asus M52AD-Xtreme did reasonably well. It's obvious it'll never be able to compete with a full gaming setup, out of the box at least, but it did manage to score 4451 overall in 3DMark11. Furthermore, the system performed well in PCMark8, with a score of 4560. Although not the highest scores we've ever seen, they're good enough for the average home user.

Aside from the performance, you also get CyberLink PowerDirector and PhotoDirector, an Asus WebStorage setup with 100GB of cloud storage available, Music Maker Jam audio software and an all-in-one system manager tool that will keep you up to date, backup and recover your work and support your Asus PC through its lifetime.

The design of the system is pretty good, the case has a black/grey metallic effect with red trim running along the front as a 'foot'. There's a large circular, metal power button with white LED behind, and the optical drive is hidden behind a glassy faceplate, with the same covering the secondary drive bay too.

Internally, there's space to keep everything cool, although the components aren't known for generating a huge amount of heat. Sadly, though, there's little by way of upgrade potential due to the motherboard. You could always swap the GPU for something better or upgrade the memory without too much trouble, though.

▲ *The performance of this PC is certainly good, but it's a little pricey*

The only real negative is that, for £920, we expected more performance and a better selection of components. Looking through the advertisers in these pages will reveal a more capable system for less money. It isn't a bad PC, just a tad too expensive. Were it to have an SSD and hard drive – and, maybe, an upgraded GTX950 GPU – we would feel very differently, we suspect.

mm David Hayward

A good family PC, but a little too expensive

eScan Internet Security Suite

Roland Waddilove puts his PC's security in eScan's hands

DETAILS
- **Price: £36**
- **Manufacturer: MicroWorld Technologies**
- **Website: www.escanav.com**
- **Requirements: Windows XP, Vista, 7, 8, 10, 1GB RAM, 1GHz processor, 1GB disk space.**

When you think of the top antivirus and security companies, eScan is probably not among the names that come to mind. However, the company has a range of products from the basic eScan Antivirus to the top of the range eScan Universal Security Suite. On test here is a package in the middle: eScan Internet Security Suite, which offers more than basic antivirus protection, but it is still reasonably priced. New to the this version is an updated UI, secure delete, USB vaccination, dynamic phishing filter, and eScan Security Network.

A recent Real-World Protection test by AV-Comparatives showed that eScan detected nearly every malware attack, scoring higher than Bullguard, ESET, Lavasoft, McAfee, Sophos and others. It wasn't the best, but it was a pretty good result. It has received 11 Virus Bulletin VB100 awards from its last 12 tests stretching back several years. Those results should dispel any doubts about its security and its ability to protect against threats. Indeed, no problems were encountered while it was on the test PC.

eScan's home screen shows the status of each of the security modules.

The firewall module has useful information and charts for knowledgeable users.

The Suite provides a collection of security modules: file antivirus, web and parental control, privacy control, mail antivirus, antispam, firewall, endpoint security and cloud protection. File security is real-time antivirus protection and there are quite a few configuration settings, such as include/exclude zip archives, exclusions and exceptions, blocking executables on USB flash drives and network locations, and an option to protect folders you specify from deletion or modification.

The Endpoint security module enables you to lock down a computer and only run applications you specify. You can also select the times at which restrictions should apply. This could be used to increase your own protection, but is really useful when used with the parental controls, that can block websites unsuitable for youngsters and teens.

The firewall interface is not as simple as some, but if you know how these things work, you can dig out useful information, such as which applications have accessed the internet, how much data that have up/downloaded, Expert rules, application rules, trusted IP ranges and MAC addresses can be specified.

Privacy control, a clean-your-tracks module akin to tools such as CCleaner, can be scheduled to run automatically fired up manually. It cleans caches, cookies, browsing history, the Recycle Bin, recently accessed files lists, and so on. A Secure Delete facility also enables you to erase specified files and folders permanently. Mail antivirus and Antispam are for email clients as opposed to web-based email.

The user interface is functional, rather than attractive, and easy enough to find your way around. You can quickly see enabled modules, there are Update and Scan buttons and schedules can be configured to perform automatic malware scans and virus definition updates.

This is a good security application that performs well and is better than some rivals, although it is not quite the best.

mm Roland Waddilove

A comprehensive security suite

AOC I2481FXH

A bezel monitor takes central stage

DETAILS
- Price: £139
- Manufacturer: AOC
- Website: www. aoc-europe.com
- Requirements: n.a.

The AOC Style-line I2481FXH is a one-piece display unit, with the 23.8" LCD monitor panel mounted to a matte silver metal stand. This combination has dimensions of 541 x 403 x 150mm (W x H x D). AOC has described its panel as having a "nearly borderless frame", and I would find it hard to disagree with this observation when it comes to the top and side of the monitor. Having grown accustomed to my old monitor with its 20mm bezel, it was quite a shock to be faced by the barely 7.5mm of black bezel around three side of this unit; I have seen and used smartphones with a wider bezel that that. The bottom of the monitor has a slightly wider strip, giving room to the OSD controls that adjust the screen's performance and visual output.

The panel itself has an aspect ratio of 16:9 with a display area of 527.04 x 296.46mm delivering a maximum resolution of 1920 x 1080 at 60Hz with 16.7 million colours. Due to the fixed nature of the metal stand, adjustment regarding height and swivel is out of the question. You are limited to tilting the screen between -3° and 20° and view content from an angle of 178° both vertically and horizontally.

You have access to a fairly limited array of connection options, located to the rear. These connections consist of a D-Sub (VGA) and two HDMI ports for adding a device such as a game's console or DVD player. There are also sockets for attaching the supplied power lead and plugging in a set of headphones for when a private listening session is called for. Leads for power, D-Sub and HDMI connection are provided in the box.

As is standard with AOC display units, the company provide a software CD. Included on this CD are monitor drivers for various operating systems, utilities and a PDF version of the User Guide viewed in a browser or using Adobe Reader. The bundled utilities consist of the standard collection of tools that AOC tends to include with its product line up.

While many users are happy adjusting the screen display using the OSD features, some prefer to use the supplied iMenu utility. With this software you can quickly switch between parameters of interest that include Luminance, Image Setup, Colour Temperature, Colour Boost, Picture Boost and Help. Each topic features appropriate options that can be adjusted to suit individual needs.

Offering a series of drop-down pick lists, the e-Saver utility allows for the setting up of time activators designed for specific tasks such as waking up or shutting down a computer. The third member of this trio of utilities is Screen+, which adds dual monitor and different screen layout functionality.

The I2481FXH features built-in AOC Flicker FREE technology and delivers a bright clear display that would suit those looking for a general purpose monitor with a bit of style.

mm Michael Fereday

AOC I2481FXH Features	
Panel type	IPS
Panel size	23.8" / 60.5cm
Aspect ratio	16:9
Brightness	250cd/m2
Contrast ratio dynamic	50M:1
Contrast ratio typical	1000:1 (CR)
Pixel Pitch(H) (V)	0.2745mm
Display area	527.04mm x 296mm (H x V)
Viewing angle	178° (H) / 178° (V)
Response time	4ms
Maximum resolution	1920 x 1080 @60Hz
Colours	16.7M

A skinny bezel, general purpose monitor

LeapFrog Epic

Reverting to a second (or, more likely, third) childhood, Michael checks out a LeapFrog product

DETAILS
- Price: £120
- Manufacturer: LeapFrog
Website: www.leapfrog.com
- Requirements: n.a.

The different aspects of Explore, Play, Imagine and Create provide the name for LeapFrog's latest product aimed at young children. This is the LeapFrog Epic, an Android tablet aimed at children aged between three and nine.

Ensuring that this tablet, with its 7" capacitive touch-screen, is not mistaken for anything other than a child's device, is the LeapFrog green bumper that surrounds it. This bumper has a slot for holding a supplied stylus attached to the tablet with a cord. As well as providing an useful area grip, the bumper also helps protect the unit if it is accidentally dropped/thrown across the room at a sibling.

The tablet's screen has a resolution of 1024 x 600. While hardly state of the art, this resolution is adequate for its purpose. The viewing angle is rather restrictive, though, which is could be problematic when a child is trying to use the product with friends.

Everything is powered by a 1.3GHz processor with access to 1GB of RAM. As standard, you get 16GB of storage but this quickly gets reduced to around 10GB once the Android operating system and software has taken its share. There is an option to add a further 32GB of storage by inserting a micro-SD card, though. A lithium-ion battery, recharged via a micro-USB port on the base of the tablet, should give around six hours of use from a single charge.

LeapFrog has fitted both front and rear mounted cameras for capturing still images and video clips. However, neither camera has a zoom capability and flash is not provided. As a result the quality of the captured content is barely adequate from these 2MP cameras.

The tablet has a built-in motion sensor accelerometer feature that is required for some of the apps. Support is provided for wireless wi-fi 802.11 b/g/n and Bluetooth 4.0 with the latter being turned off by default.

During the initial setting up of the product, when the parent can set restrictions on the devices use, a LeapFrog account will need to be created. Information regarding a parent and any children will need to be entered. This information will include an email address, parental numeric lock code along with the sex and age group of each child using the tablet.

On subsequent boot-ups of the tablet – a process taking approximately 37 seconds, following a three second depress of the power button on top of the device – a child's log-in screen will be displayed. This will be followed by a Home screen with a scrolling city landscape and a customisable group of six apps, these include a calendar, camera and search, but can be changed for others that the child prefers.

While some of the apps have educational value, this has to be put up against the strong American bias, seen in both the content and the voices used. I also felt that the initial selection of apps seemed to be more suited to those at the younger end of the stated age range. Of course more apps are available for purchase from the LeapFrog store, where the content is classified under headings such as Originals, Best Selling, Games and Ship by Age or Skill. Prices at this store tend to fall in a range between £3.50 and £15.

mm Michael Fereday

A reasonable product spoilt by its obvious American bias

GROUP TEST

SLI Motherboards

While most of us can happily get away with a single graphics card in our systems, there are others who demand only the best frame-rates in games or the best video quality and speeds when video editing.

For these people, a multiple graphics card setup is a good way to go. If your GPUs are based on Nvidia, technology, then SLI is what you're after, and the six motherboards on test this week all offer than ability.

ASRock 970 Extreme4 Socket AM3+

DETAILS
- Price: £71
- Manufacturer: ASRock
- Website: goo.gl/drskEI
- Requirements: AMD AM3+ CPU, DDR3 RAM, 800W+ PSU for multi-GPU

The ASRock 970 Extreme4 is a cheap SLI-capable motherboard

ASRock famously has a selection of motherboards on offer that can happily compete with the likes of MSI and Gigabyte but without the extra few numbers after the pound sign. This, although very appealing, isn't always good, and there are times when ASRock's line-up isn't quite as appealing as it could be.

The ASRock 970 Extreme4 is an ATX, 305 x 244mm, motherboard with support for the latest AM3+, AMD Phenom II X6, X4, X3 and so on, right down to the Sempron processors. There are four DIMM slots for dual-channel DDR3 2100 (overclocked) memory, five SATA 6Gbps, 7.1 HD audio, four USB 2.0 and two USB 3.0 ports and, of course, three PCIe 2.0 16x slots, two PCIe 2.0 1x slots and a pair of standard PCI slots for legacy hardware.

Although reasonably spaced apart, it's a bit of a tight fit between PCIe slots two and three, compared to the gap between PCIe slots one and two. This means that a pair of Nvidia GTX 970s will fit comfortably in slots one and two, but when we added another in slot three, things started to get a little too tight for our liking. There was a small gap, admittedly, but the air flow was severely restricted, which didn't sit too well with us. In the end, we placed a fan above slots two and three to draw away some of the heat generated.

That said, three-way SLI is certainly achievable, and if you were to apply a better cooling system than we did, we're pretty sure you'll be able to reap the benefits of a triple graphics system without coming across too many overheating problems.

The 970 Extreme4 isn't short of features, though. The Unlock CPU Core feature allows a significant level of overclocking, provided you have the right processor in place to begin with, and support for AMD's eight-core Black Edition chip is something of a draw for those who want a powerhouse system without the extra expense.

Speaking of expense, the comment we made at the start of this review regarding ASRock's cheap and cheerful nature is apparent here. Although the board is a couple of years old now, the £71 price isn't something you can turn your nose up at – especially when you consider the various ASRock Extreme Tuning utilities, instant flash, boot failure guard and the well-received XFast555 technology. This allows for the creation of a RAM Drive, improved gaming functionality through the Ethernet port and five times faster USB performance. Of course, the settings need to be right before you can enjoy these benefits, but ASRock enthusiasts swear by them.

All in all, the ASRock 970 Extreme4 board isn't too bad. It may lack some of the more modern features and applications that the more expensive boards have, and it's not quite as well laid out or designed, if we're being honest, but for the price, it's not a bad choice if you're building a cheap AMD-based multi-GPU system.

Asus Z87-Pro Socket 1150

DETAILS
- **Price: £220**
- **Manufacturer: Asus**
- **Website: goo.gl/EkZte7**
- **Requirement: Intel socket 1150 CPU, DDR3 RAM, 800W+ PSU for multi-GPU**

Good, but it's shockingly expensive

The Z87-Pro range of Asus motherboards is starting to show its age, but it's still available and still manages to dish out some favourable benchmarks when part of a gaming system build.

This is an ATX board that supports Intel's fourth-gen Haswell processors and offers eight SATA 6Gbps ports, four USB 3.0 ports, four DIMM DDR3 slots for a maximum of 32GB at 3000MHz (overclocked) and 4K UHD integrated graphics.

The SLI support comes in the form of two PCIe 3.0 16x slots, one PCIe 2.0 16x slot and four PCIe 1x slots. As expected, the two PCIe 3.0 slots run at 8x if two graphics cards are fitted and at full 16x provided only one is present, with the third PCIe 2.0 graphics slot running at 4x. Interestingly, there's no legacy PCI slot on this board, which as a result offers a tad more room when fitting a third card, although not by a huge amount.

It's certainly a capable motherboard

Fitting three GTX 970s was reasonably easy, and there was enough of a gap for decent air flow throughout the system and between the first two cards. It's worth noting, though, that the third card was a little snug, but with a few more millimetres than the ASRock entry.

The Asus Z98-Pro comes with a Wi-Fi GO!, which is a dual-band wi-fi card that can handle 802.11 a/b/g/n 2.4 and 5GHz frequencies, as well as Bluetooth connectivity, both V3.0 and V4.0. You'll also get a branded Asus dual-band 2T2R antenna in the box and full instructions on how to setup a wi-fi hotspot.

The Asus UEFI offers a far better graphical interface than most other boards on test. There's an EZ mode, which allows you to quickly get to the most used and important features of the board and alter settings such as the fan speed, temperature, time and date. And there's an Advanced mode, which offers greater control of the board's features and opens up the overclocking potential in a more traditional BIOS-like environment.

The design of the board is rather impressive looking. With a black PCB and yellow connectors and slots, complete with gold heatsinks and stylised Asus logos throughout, it's certainly very eye-catching and would make for an excellent open view system. But although it looks splendid, we did find it feeling a little cheap compared to the other boards we're testing in this group. It works perfectly well, but there was a little too much flex, and a couple of the PCI ports were raised slightly on their connections. Plus the locking clip on the CPU socket felt as if it would break off without too much difficulty.

Having said that, this is an good board overall, which it should be, since it costs somewhere in the region of £220. But we'd expect a little better quality and more manufacturing care for that price.

Gigabyte GA-Z97X-Gaming 7 Socket 1150

DETAILS
- Price: £125
- Manufacturer: Gigabyte
- Website: goo.gl/e8CnCE
- Requirements: Intel socket 1150 CPY, DDR3 RAM, 800W+ PSU

It's well priced and capable of delivering good performance

micro mart
Quality 7
Value 8
Overall 7

This is a board from Gigabyte's Gaming range, specifically the Gaming 7. The Gigabyte GA-Z97X is an ATX board that can accommodate fourth- and fifth-generation Intel Core processors. You'll find four DIMM slots for up to 32GB of DDR3 3200 (overclocked) memory, on-board graphics with support for up to 4K UHD resolutions and a Killer E2200 pro gaming network port. The GPU slots include one PCIe 3.0 16x, one PCIe 3.0 8x and one PCIe 2.0 4x, along with three PCIe 2.0 1x slots and a single legacy PCI slot.

Much like the ASRock board, we found the gap between PCIe slots one and two more than enough to fit a couple of big GTX 970s. However, there's a ridiculously small gap between PCIe slots two and three and, as you would expect, by populating all three slots you're dropping the PCIe slots to 8x and 4x speeds. But it's the cooling that remains a problem in this instance.

That aside, Gigabyte has adopted a gaming-style look, with a popular red and black theme to its Gaming 7 boards. And due to its gaming heritage, you'll find such wonderful features as Gigabyte Audio, with a better than standard audio output performance through the 7.1 channel system. There are also high-end capacitors, gold-plated audio hardware, a SATA Express Connector and M.2 on-board connector. Plus you'll also have access to Gigabyte's system management App Centre, for overclocking and cloud-based features.

Working with the board wasn't quite as cramped as with the ASRock or Asus example we had. Although there wasn't a lot of room for the third graphics card, we did manage to get a tiny gap in place, and the system ran reasonably cool. Saying that, we wouldn't fancy attempting an air overclock with all three cards in place. In short, we chickened out, partly due to the cooling problem and partly due to the fact that we have to return the board.

It's certainly a decent enough design, though, and if you're only planning on a dual SLI setup, then you'll find the Gigabyte GA-Z97X-Gaming 7 more than capable.

The Gigabyte GA-Z97X-Gaming 7 manages to combine all that technology and gaming style into a motherboard that only costs in the region of £125. In the end, though, we think the final decision will be based purely on whether the user prefers Gigabyte products over a competitor and the fact that newer Skylake models are now appearing with far more on offer.

The Gigabyte GA-Z97X Gaming 7 is a good all-round SLI motherboard

MSI X99A SLI Plus

DETAILS
- Price: £170
- Manufacturer: MSI
- Website: goo.gl/zi2mBl
- Requirements: Extreme Edition Intel core i7 processors LGA 2011-3, DDR4 RAM, 800W+ PSU for best results

There are some excellent features on offer

Next up, we have the recently released MSI X99A SLI Plus edition board. It supports Core i7 Extreme Edition processors and is quite a dominating thing to behold. There are four 16x PCIe slots (supporting quad SL setups), eight banks of DDR4-3333 (OC) memory up to 128GB quad-channel mode, and SATA Express (SATAe) connectors for the new generation of SSDs that can churn out an eye-watering 10Gbps transfer rates – and that's just the tip of the iceberg.

The design of the board is black throughout, with angled and futuristic VRM and PCH heatsinks, super ferrite chokes and aluminium solid capacitors. This ATX board would certainly look the business inside an LED-festooned, windowed case.

> **"Everything about it screams overclocking, but it's ideal for pretty much anything"**

As we've come to expect from MSI boards, the OC Engine and OC Genie are incorporated to allow more flexibility when trying to hit higher clock speeds. With the OC Genie you can press the appropriate button on the board while the system is powered off, and on the next boot the processor will automatically overclock to its optimal performance.

Turbo M.2, Guard Pro, USB Steel Power, ten SATA-3 ports (two of which are reserved for SATAe), four front and eight rear USB 3.0 ports, optical S/PDIF out, five OFC audio jacks and the Command Centre software all make for a board that you would expect to cost in the region of several hundred pounds. However, MSI has managed to squeeze all this into a wallet pleasing price of around £170.

Sadly, we didn't have four GTX 970s available to test the full quad-SLI setup, but the three that were on loan to us were fitted without any problem and with a sizeable gap between for maximum airflow. However, we wouldn't fancy trying to squeeze in the fourth card, as the gap between slot three and four is exceedingly tight.

As you would expect from these specifications, this is an high-end gaming motherboard. Everything about it screams overclocking, but it's also ideal for pretty much anything, with the Military Class 4 standard components providing highly stable performance for any kind of system.

Of course, if you're building an SLI, multi-GPU system, then the MSI X99A would be an ideal base to work from. If for some reason you're not impressed by the X99A SLI Plus, then there are 14 other X99A motherboards from MSI, each being as impressive as the last, so we're fairly sure you'll find something in there you'll like.

The MSI X99A SLI Plus represents a fantastic deal, where you can unleash the full potential of your hardware, safe in the knowledge that you're doing so on a stable, robust platform.

The MSI X99A SLI Plus is ideal for overclocking enthusiasts

micro mart
8 Quality
8 Value
8 Overall

MSI Z97 Gaming 5 Socket 1150

DETAILS
- Price: £116
- Manufacturer: MSI
- Website: goo.gl/3ct5gh
- Requirements: Intel socket 1150 CPU, DDR3 RAM, 800W+ PSU

The quality is superb, as is the price

The second MSI motherboard this week is the company's Z97 Gaming 5 motherboard. It was released earlier last year, so users have had some time to experiment with it and push its limits.

The MSI Z98 Gaming 5 is an ATX (305 x 244mm) board that can support fourth- and fifth-generation Intel Core i7, i5 and i3 processors, among others. It has four DIMM slots for up to 32GB of DDR3 3200 (overclocked) RAM, six SATA 6Gbps ports and a single M.2 port. Plus, there are four USB 3.0 and four USB 2.0 ports on the rear, along with a Killer E2206 Gigabit Ethernet port. Finally, it has three PCIe 3.0 16x slots and four PCIe 2.0 x1 slots.

It's the well-spaced PCIe slots that make this such as well-balanced and sought after board among the system building elite. You can comfortably fit three MSI GTX 970 graphics cards next to each other without the feeling that you're about to strangle the system of any much needed air cooling. In fact, with a little bit of clever cable management, you can effectively have a good few millimetres free either side of the centre graphics card and thus plenty of circulation to keep everything cool. Obviously, more exotic methods of cooling will require a slightly different setup, but we're confident that with even the inclusion of watercooling, there's still ample room.

Being an MSI board, you're not just getting the usual run-of-the-mill extras included with the package. There's heaps of wonderful technology here, including Audio Boost 2 with an isolated audio PCB, and a Killer E2200 gaming-centric network port that's designed to prioritise online gaming bandwidth, chat and other such traffic. M.2 offers exceptional speed to those who have invested in that storage solution and, of course, as with most other MSI boards, the Z97 Gaming 5 has Military Class 4 components throughout.

All of this means that not only will you have an incredibly stable and lightning quick base on which you can build your system, but there's also plenty of room of overclocking, circuit protection and the reassurance of quality that generally comes with all MSI boards.

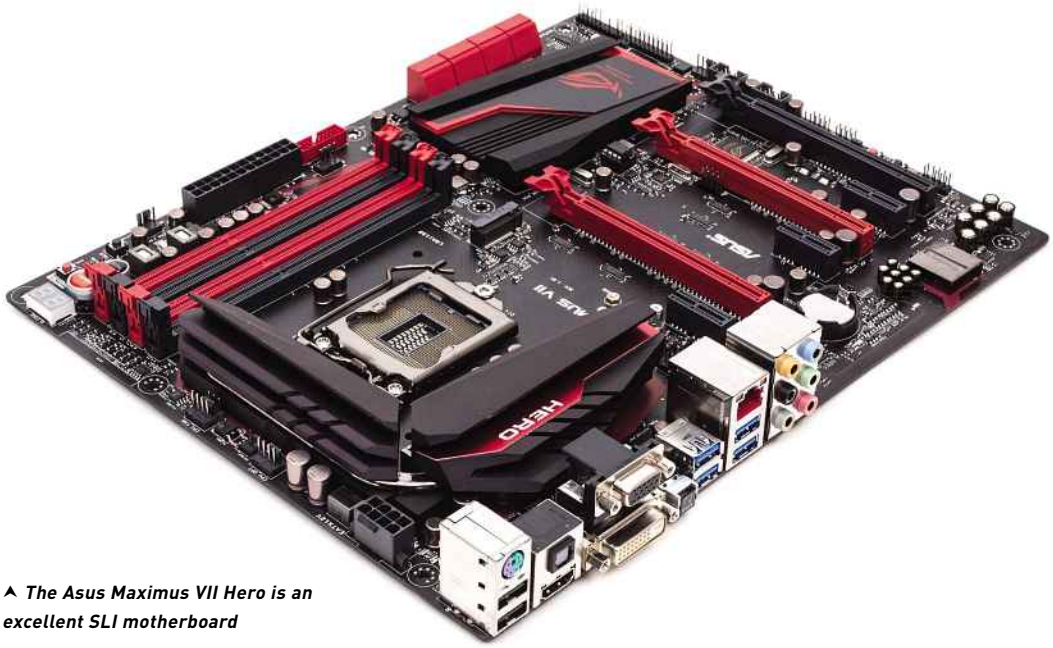
The list of features does go on for a fair while, and we could rave about them for a number of pages more. In this instance, though, it's the multi-GPU functionality that really makes this motherboard stand out from the crowd. Whereas most of the previous entries have had some tight-fitting PCIe slots, the Z97 Gaming 5 is a breath of fresh air with its far wider gaps between the slots.

The price isn't too bad either, meaning the MSI Z97 Gaming 5 offers excellent value for the amount of technology and the sheer number of features.

The MSI Z97 Gaming 5 is an excellent SLI motherboard

Asus Maximus VII Hero

DETAILS
- Price: £170
- Manufacturer: Asus
- Website: goo.gl/5Hhm70
- Requirements: Intel socket 1150 CPU, DDR3 RAM, 800W+ PSU



The Asus Maximus VII Hero is an excellent SLI motherboard

The Asus Hero range of motherboard has had a good run over the last couple of years and, let's face it, any motherboard you decide to call the Maximus Hero has to have something pretty special about it.

This version of the Hero range, the Maximus VII Hero, is a highly regarded Z97 chipset motherboard with support for fourth- and fifth-gen Intel processors for the 1150 socket family. You'll find four DDR3 memory slots for a maximum of 32GB, eight SATA 6Gbps connections, an M.2 socket, four USB 3.0 ports, optical S/PDIF and a Republic of Gamers SupremeFX eight-channel HD audio chip.

The multi-GPU element comes in the form of three PCIe x16 slots, with the first at x16 and the second at x8 when populated, and if the third slot is occupied, then it'll drop to x4 mode. In among the GPU slots there are also three PCIe x1 slots.

Much like the MSI Z97 Gaming 5 board we looked at, the positioning of the PCIe slots on the Asus Maximus VII Hero is particularly well designed. There's plenty of room between the first and second PCIe slot and certainly more than enough between the second and third slot for the trio of Nvidia GTX 970 cards we were testing the group with.

As well as being an ideal multi-GPU motherboard, the Maximus VII Hero also comes with a few extra aces up its metaphorical sleeve. There's a strip of red LEDs running around the board that light up and highlight certain areas of significance along the PCB – such as the PCH cooler and ROG branded components.

You also get ROG improved Ethernet connectivity, with LANGuard and GameFirst III features, and there are a couple of buttons on one edge of the Maximus VII Hero that can boost the output to your headphones or speakers – called Soundstage – and instantly apply your favourite audio settings in-game regardless of the operating system. The other button clears the CMOS after an unsuccessful overclock.

The design of the Asus Maximus VII Hero is quite exceptional, much in the same vein as the MSI Z97 Gaming 5 motherboard. However, we have to put Asus in top place with regards to design and style, as the Maximus VII Hero looks pretty spectacular with its black and red theme, strip LEDs and the excellent placement of the various slots and other components.

Admittedly, the overclocking functionality of the Maximus VII Hero isn't quite as easy or as comprehensive as the two MSI boards we've looked at. You won't find any overclocking profiling built into the UEFI or anything, so you'll have to do it all manually. However, it's fairly easy to navigate the relevant menus within the BIOS.

Despite the Asus Maximus VII Hero being a tad over a year old now, it remains excellent value, and has just about everything you could ask for from a great multi-GPU motherboard.

It has an excellent range of features and is superbly designed

Asus Maximus VII Hero

With a combination of features, style and ease of installation of multiple graphics cards, this week's winner is Asus Maximus VII Hero – a superbly designed and engineered motherboard, and one that's not a bad price either.

MSI Z97 Gaming 5 Socket 1150

The MSI Z97 Gaming 5 is one of the best multi-GPU motherboards we've reviewed. It's well designed, very well priced and looks pretty good too.

It was a tight one between the two winners, but both will do an excellent job of being the motherboard for an SLI computer.

How We Tested

Each motherboard was tested with either an AMD FX 8320 Black Edition CPU or an Intel fourth-gen Core i5-4670K. We used 8GB of Corsair RAM and an 1000W 80+ Gold certified PSU. The graphics cards used were three Nvidia GTX 970s.

	ASRock 970 Extreme4	Asus Z87-Pro	Gigabyte GA-Z97X-Gaming 7	MSI X99A SLI Plus	MSI Z97 Gaming 5	Asus Maximus VII Hero
Price	£71	£220	£125	£170	£116	£170
CPU Type	AMD AM3+	Intel 1150	Intel 1150	Intel 2011-3	Intel 1150	Intel 1150
Chipset	AMD 970	Intel Z87	Z97 Express	X99 Express	Z97 Express	Intel Z97
Size	ATX 305 x 244mm	ATX 305 x 244mm	ATX 305 x 244mm	ATX 305 x 245mm	ATX 305 x 244mm	ATX 305 x 244mm
No Of PCIe Slots For G/C's	3	3	3	4	3	3
No Of SATA Ports	5	8	6	10	6	6
No Of USB 3.0 Ports	2	8	4	6	4	4
No Of USB 2.0 Ports	4	4	4	2	4	2
Max RAM	64GB	32GB	32GB	128MB	32GB	32GB

Your Letters

A Strange Case!

As a novelist, many of my 'cases' are strange. Ubuntu 8.04 LTS with my legacy DDR333 IDE motherboard and AMD Sempron 2200+ cpu, was in my 'battleship steel' case. No wi-fi.

I bought a Tenda W311P wi-fi PCI card. The CD had a Linux driver, which as you may know, doesn't self-install, unlike Windows 7. The word 'compilation' gives me the Linux horrors. The little green LED on the card remained unlit! No driver installed. The card uses a Ralink RT3060chip. I gave up. Wait! Try a later Ubuntu version?

I scrounged an IDE DVD RW to replace the CD drive. Wonderful! Ubuntu 12.04 LTS 32-bit did the trick, connected by LAN. LED glowing! The driver installed automatically, from the disk or Ubuntu repository. Who cares! Next, in 'Network,' my wi-fi network appeared, I put in my password and it fired up at 19Mbps.

Firefox was slow, as were other tasks. The installed 500MB of DDR333 RAM should have sufficed. Ignoring my better instincts, I bought two 500MB sticks of cheap used DDR333 RAM. Idiot! No difference.

Micro Mart issue 1384 was my undoing. The front cover trumpeted; 'Motherboards under £50.' I spied a Gigabyte 78LMT-USB3 mobo for £41. It had legacy IDE. My system, including FDD, used IDE. Wouldn't the AM3+ m/b speed up my system? Without thinking straight, I bought one for £33.20 from **www.cclonline.com**. I then needed DDR3 memory and, alas, a new power supply.

First disaster. The board and backplane was a poor fit in the old case. I gashed my finger on the sharp backplane. Careless! The new AMD A4-7300 CPU didn't fit the socket. I had bought an 'A' series CPU that fits FM2 sockets, not AM3+. Crazy!

I swapped the A4-7300 for a decent used PCIe graphics card, then ordered an AMD FX-4300 and another stick of 4MB DDR3 memory. Next problem: no FDD connector or audio connector for the IDE DVD. Why hadn't I spotted this before purchase? The used graphics card fouled the old case's expansion slot. A hacksaw job to get the VGA port unobstructed. Beware: motherboards don't like steel filings!

I installed Ubuntu 14.04 LTS 64-bit, wi-fi installed automatically, but I had trouble with mixed IDE HDD and SATA HDD. Long story. In the end I bought a new SATA DVD-RW, ditched the IDE HDD, hooked up a spare 160GB SATA HDD. Eureka – a very fast system. I might try Windows 10 when SP1 comes out.

I had to manually configure my Thunderbird email client on TalkTalk. Hint: suppose you are joeblow@talktalk.net, then essentially, configure 'Incoming' as 'imap.talktalk.net' and 'Outgoing' as 'smtp.talktalk.net.' 'Your Name' as 'joeblow.' Elementary dear Watson.

Finally, I've ordered a new case. What! A CCL new system would have been cheaper. You may ask why I, a normally computer hardware savvy chap, got things so badly wrong? Well, my beloved wife, married 53 years, died of mesothelioma cancer in July. Need I say more?

Robert Rycroft

Controlling Stuff Under Linux

David Hayward's problems (issue 1387, page 68) with NextRemote under Linux are just another example of a company that really should decide what its product actually is.

Is the product a remote control for a telescope or is it the Windows software to control that remote control?

Because if it's the hardware, then why the hell don't they simply provide the control-code data so that other people can write nifty code to enhance the market for their hardware?

Some time ago I had precisely this problem, of needing the control codes for hardware, and the company in that case effectively said 'we don't want a bigger market'.

Back in the old days of dot-matrix printers, Epson carved a large market share by making a book that itemised all their control codes. They're still in business so what's the objection?

Tom Groves

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Raspbian 'Jessie' For The Raspberry Pi

David Briddock examines the latest official Raspbian OS

Raspbian is a free operating system based on Debian Linux and optimised for the Raspberry Pi hardware. It certainly doesn't lack functionality, with over 35,000 pre-compiled software bundles (known as packages) available to pick from. These packages are designed for easy installation and optimised for performance on a Pi. An active development community regularly contributes to Raspbian, emphasising improvement to the stability and performance of core system processes and Pi-centric packages. The latest community efforts have been focussed on porting the latest stable release of Debian 8, also known as 'Jessie' (see boxout).

Official Raspbian

From time to time the Raspberry Pi Foundation (**raspberrypi.org**) takes a snapshot of the community's work to create its own officially supported Raspbian image. In October 2015 the Foundation blogged about a major new version of the Raspbian operating system based on Debian Jessie. It's classed as a major OS release because many things have changed. These include visual improvements, new and updated apps, additional development tools and many subtle operational changes. So let's discover what changes are afoot.

Look And Feel

Since the introduction of the Raspberry Pi, booting up Raspbian meant finding yourself confronted by the Linux command line. Not any more, though, as the new Jessie image takes you straight to the desktop GUI. Of course, in 2015 this is what the majority of PC owners expect so, while it's still possible to regress to the previous behaviour, you'll need to change the relevant Raspberry Pi boot configuration settings if that's what you want.

When the desktop GUI appears look carefully and you may notice a few subtle differences. For example, graphical elements like menus, check boxes and radio buttons (also known as widgets) now look a little more modern. The reason is that Raspbian Jessie is based on version 3 of GTK+, the user interface toolkit used to create the LXDE desktop environment (see boxout).

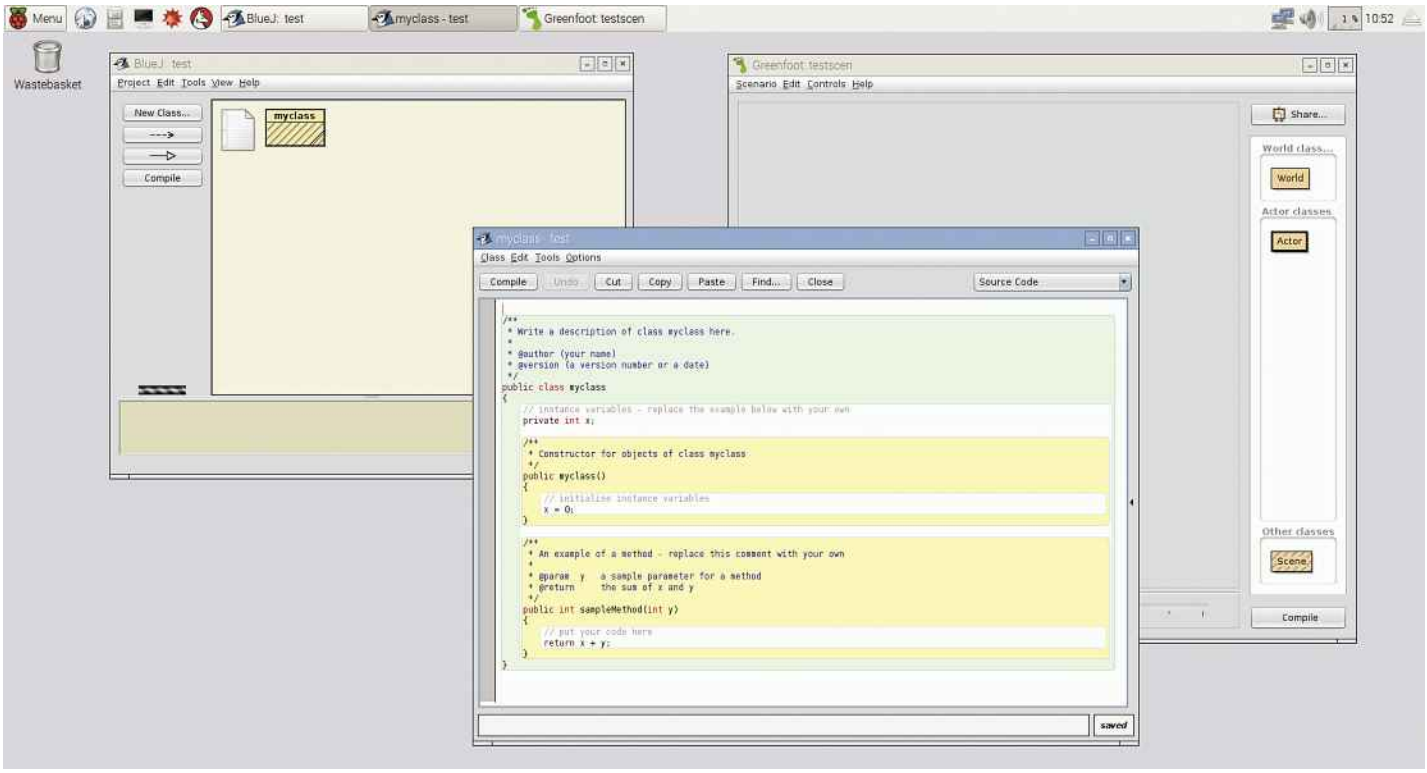
Observant Pi owners may have noticed certain apps were updated for GTK+ version 3 compliance even before Raspbian Jessie appeared. However, while the desktop has a version 3 theme a significant number of Raspbian apps still use GTK+ version 2. This less-than-ideal situation will hopefully improve over time.

Configuration Options

Unsurprisingly, Raspbian Jessie ushers in an enhanced set of configuration options. To help manage these options there's a couple of brand new dialogues, located under the Preferences option in the main menu.

The first is the Raspberry Pi Configuration dialogue, which replaces the previous raspi-config command-line application (which is still available via the 'sudo raspi-config' command). It provides all the original functionality, and a few new features too, all wrapped up in an improved user interface (see image). Its four separate tab views allow you to amend system information, enable and disable interfaces, tweak performance and setup internationalisation options, such as timezone and keyboard. You'll also see a couple of new boot options, such as the ability to automatically log in as the 'pi' user when booting to either the desktop or the command line.

Raspberry Pi 2



▲ *BlueJ and Greenfoot are additions that may interest potential and experienced coders*

Raspbian is designed to automatically detect many of the common keyboards sold for the Pi and set up the appropriate GUI keyboard drivers. However, if for some reason that doesn't work there's a new keyboard config capability, access from inside the Localisation tab, where the country and keyboard type can be chosen manually.

> **"Debian releases are named after characters from the Toy Story films"**

Another new dialogue is the Main Menu Editor, which is actually a Pi-specific version of a Python menu editor app called Alacarte. Its purpose is to make it easier for people to add or remove main menu items. Incidentally, the 'Other' menu group has returned (apparently many people missed this feature), although now it only appears if one or more installed apps don't belong to the existing categories.

Software Updates

The Raspbian Jessie image includes quite a few app updates. In general these updates are focussed on stability, bug fixes and performance improvements. One example is an updated version of the Epiphany web browser, an app that was added to Raspbian fairly recently to improve web surfing performance. There are many more across all the gaming, productivity and software development categories however.

Let's look at some of the personal productivity and development app highlights Jessie has to offer.

Personal Productivity Apps

Now the significantly more powerful Raspberry Pi 2 is available there's a drive to make the Pi user experience more like the one you'd expect from a standard PC. Part of this desktop-PC-like theme is a focus on pre-installing the kind of productivity and educational apps often found on Windows or Mac PCs. For example, this Raspbian Jessie image has the LibreOffice suite and Claws Mail.

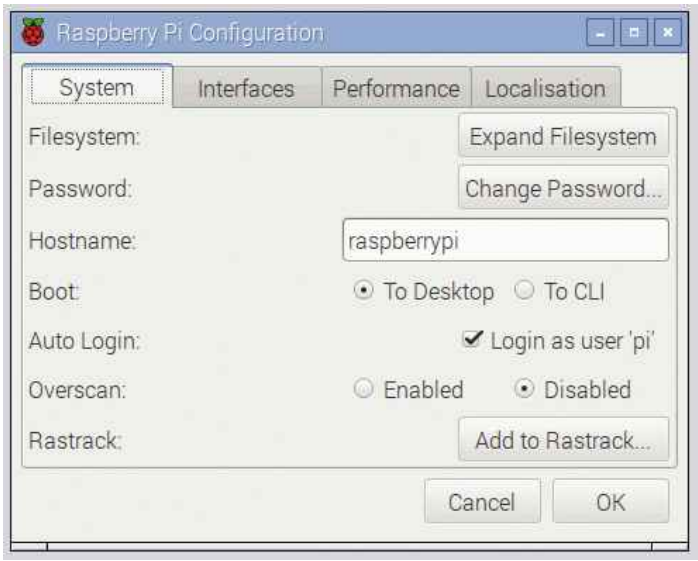
LibreOffice is a popular open source alternative to Microsoft Office with word processor, spreadsheet, presentation, vector drawing and database elements. In addition to a familiar looking user interface it can create, load, edit and save Office-format files.

Claws Mail is an email client for those who don't want to manage their email via a web browser. Claws supports all the common email

Why Choose Jessie Over Wheezy?

Major releases of Debian Linux, a distro respected for its reliability and stability, often take a while to appear. When they do, though, they're named after characters from the *Toy Story* films; the previous official Raspbian was based on Debian Wheezy, which got its name from the *Toy Story 2* penguin with the lost squeaker. The latest stable release of Debian – version 8 – is named Jessie after Woody's cowgirl co-star from the same movie (**debian.org/releases/stable**).

Unless you're a Linux expert the differences may seem subtle, but many of the modifications target performance and flexibility, especially in regard to the control of system processes. As always, there are numerous bug fixes too.



The new Config dialogue

protocols and has similar functionality to standalone mail clients like Windows Mail or Mozilla's Thunderbird.

Another welcome productivity feature is the ability to capture a screenshot of your Pi's display simply by pressing the keyboard's Print Screen key. Behind the scenes the open source scrot (SCReen shOT) command line utility is activated to capture the screen image and store it as a PNG-format image file in your home directory.

> **With the new Jessie image you'll be taken straight to the desktop GUI**

And did you know in Linux it's a little risky to just pull out a USB drive? This is because the system writes data to the drive as a background process. Well, now there's an eject icon at the top right of the menu bar to safely eject USB drives without the risk of losing data. Click the eject icon then wait for a safe-to-remove prompt for the chosen drive.

Scratch

As we mentioned above the coding community have quite a few reasons to upgrade to this new image.

Fans of the popular Scratch development environment will discover there's a new version pre-installed on Raspbian Jessie. With Scratch you build apps with colourful interconnected blocks (rather than typed code statements) to create animations, games and General Purpose Input Output (GPIO) control apps.

Deep under the covers Scratch is built with Squeak, a dialect of the Smalltalk coding language. Major changes to the Squeak implementation and its runtime environment mean Scratch now runs significantly faster than previous releases.

Another welcome Scratch feature is the addition of a built-in GPIO server. This makes it much simpler to build apps that control the GPIO pins and Pi add-on boards. In fact, this server offers much more than just GPIO functionality, as it also delivers direct access to the Pi's built-in camera interface and network IP addressing.

Python

Talking of GPIO ports, Python developers always needed to launch the Python app with the superuser-level 'sudo' command in order to access the GPIO. Thankfully, this is now fixed in Raspbian Jessie, so you can just run Python in the normal manner.

Are you interested in trying your hand at Python game development? Well now there's an easier way to get started. With Raspbian Jessie the Pygame Zero game coding environment is installed by default. This clever Pygame library provides a novice-friendly set of statements to make game coding easier, faster and more fun.

The new Raspbian Jessie image also has enhanced Python (and Scratch) support for a selection of popular Pi peripherals. Examples include the Explorer HAT and Sense HAT (as used in the Astro Pi project) plus the Pibrella, PiFace and PiLite add-on boards.

Java

For Java coding fans there are two new applications in the Raspbian Jessie main menu Programming category. Called BlueJ and Greenfoot they're both aimed at simplifying the app building experience. They offer a graphical coding environment that mixes mouse-driven design and code generation with traditional hand-coded statements.

Greenfoot, a joint project by the University of Kent and Oracle, is specifically aimed at introducing a younger coding audience to the concepts of constructional thinking and design, while BlueJ is probably more applicable to those who already have a little coding experience.

Look in the /home/pi/Documents directory and you'll find sample projects for both BlueJ and Greenfoot.

Upgrade Process

As Jessie is a major Raspbian release the Pi Foundation doesn't recommend simply performing an OS update. The reason is there could be problems accommodating the sheer number of OS changes and potential issues with previously installed apps.

Instead, the recommended approach is to start from a clean image. The new Raspbian Jessie image can be downloaded from the official download page (**raspberrypi.org/downloads**). Alternatively the same image is included in the latest NOOBS (New Out Of the Box Software) release, which is all about making the installation process as easy as possible.

Of course, you must make a backup of all your data including text files, office documents, images, audio files, movies and development code. Then, ideally, you should use a new SD card for the Jessie image. If not, then first copy the entire contents of the older SD card onto a USB drive. This way you'll know everything has been captured, and you can copy or move files around at a later date.

It'll be a while before another major official Raspbian release appears, so moving to Jessie soon is certainly going to be worth the effort. Have fun! **mm**

GTK+

Originally named the GIMP Toolkit this is an open source cross-platform set of 200+ widgets created used to build graphical user interfaces (GUIs). The LGPL licence allows both free and proprietary software use.

Written in C, its primary focus is Linux X11 windowing systems, Qt based GUIs and the new Wayland GUI. However, the portability of C means that it runs fine on other platforms, including Windows and Mac OS X.

Top 5 Potentially Disappointing Tech Gifts

Yes, it's the thought that counts, but maybe think a bit harder?

1 Cheap Tablet

With Amazon having just released a £49 tablet, it's actually pretty easy to get someone a cheap but nevertheless usable device. However, you might decide to go even cheaper and pick up one of those £20 things you saw on eBay or Amazon. Yes, they come from a Chinese manufacturer you've never heard of, but how bad can they be? Well, the answer to that is very bad. Very bad indeed. Sure, there are some bargains to be found, but as with most things in life, you generally get what you pay for, so there's a good chance that the cut-price tablet you're thinking of getting for someone will be slow, unreliable and will probably break five minutes after being unwrapped.

2 Tablet Cover

Of course, many people these days already have a tablet, so you don't need to buy them a new one. What you could get them, though, is something nice to put theirs in. That's fine, but it's also potentially risky, because even if you know they have an iPad or a Nexus, you might still end up buying the wrong case. What you really need to know is the exact model of iPad or Nexus. And even if you get that right, there's the matter of taste. You might think your children would love nothing more than sparkly plastic covers with fake diamonds on them, but they might actually want something… erm, good.

3 Hard Media

Again, the matter of taste is important here: if you're going to buy someone a CD, DVD or Blu-ray, then you better know exactly what they like (and that they don't already own the thing you want to buy them). But that's not the only problem with hard media. Perhaps it's just us, but unwrapping a present to find a CD or DVD became disappointing sometime in the noughties. By that point, downloading media was already common, and these days we don't even need to do that, thanks to streaming services like Spotify and Netflix. Some people say they like to have the artwork and that the quality is better, but for many folk these days, the convenience of digital media is all that matters, and little plastic discs are the last thing they want.

4 iTunes Voucher

Considering that we just said we like digital media, it might seem odd to then say that an iTunes voucher is a bad idea. But giving someone money to spend in Apple's digital store comes with a couple of potential pitfalls, the first being one that's common to all vouchers: the recipient might not shop with that company and may have no interest in doing so. However, there's another problem that's specific to iTunes and to all Apple products: their price. Although deals can be found, on the whole you can expect to pay more for Apple's products, which means your loved one is going end up getting a smaller gift from you than they would from a rival service. Then again, digital media often is overpriced, so that might explain why people still give DVDs and CDs to each other.

5 Mini Helicopters

The toy helicopter used to be a luxury item, costing hundreds of pounds, and although those high-end models still exist today, you can also pick up a basic one for a fiver. Yes, it'll be small, but it will fly. That's fantastic, and these things genuinely are fun, but the problem we have with them is the battery life. Before you actually buy one of these things, look at the box and find the bit of information regarding the charging time. Often, you'll find it reads something like this: "Requires two-hour charge for ten minutes of flight." That's like going to the cinema, sitting through an hour of ads, then getting to watch the first scene of the movie, before being subjected to yet more ads. If you are going to buy someone one of these helicopters, though, maybe just give it a charge before you wrap it up, so they can at least enjoy it immediately without having to wait.

The bad news: the battery only last ten minutes. The good news: most kids only have a three-minute attention span anyway

The Easy Guide To Flashing An Android Phone

Part 2: Custom ROMs

Last week, it was stock ROMs, so this week it's custom ROMs – ones designed by enthusiasts. Jason d'Allison shows you that the flashing process isn't the dark art it's often cooked up to be...

As before, I'm using a Samsung Galaxy Note (GT-N7000). It's an oldie but a goldie, and given Samsung's runaway popularity in the Android world, a Galaxy makes sense as the basis for a guide on ROM flashing. The process is pretty much the same across the whole model range. It's often somewhat different with other Android brands, but this guide still has value as an overview and introduction.

Why install a custom ROM, though? Well, maybe you hate your stock ROM's skin – TouchWiz in the case of a Samsung phone. A skin can cripple performance, as can all that bloatware manufacturers love to include. A custom ROM will usually be 'clean'. Most likely it'll also provide greater functionality and flexibility. The headline grabber, however, is that you can breathe new life into a phone that's no longer being supported. Want a newer version of Android, perhaps even the latest? You got it.

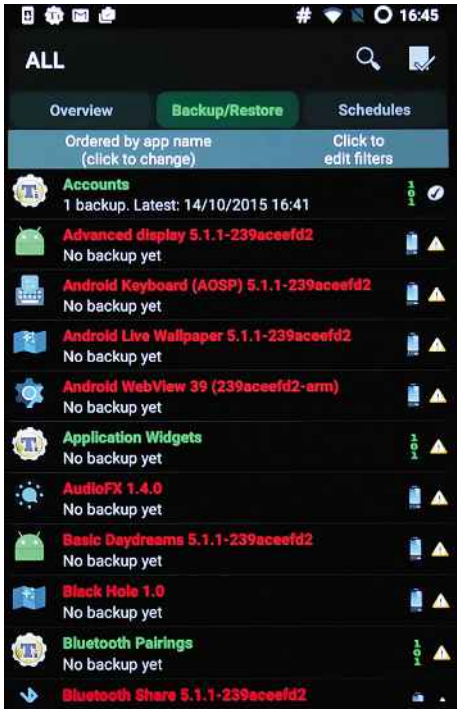
This guide assumes your phone is currently running a stock ROM. If it's not, there could be complications, so I advise you to install one before going further. I covered this procedure in part one of this guide.

Safe, Not Sorry

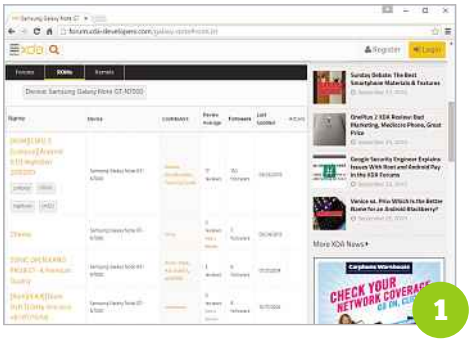
As also covered in part one, before you start, you should ensure you've backed up everything of value. Ordinarily, you won't lose anything on a micro-SD card or in the phone's default media locations, but why risk it?

Forget about Samsung's PC software: Kies and Smart Switch. Typically, these will only play ball if your Android installation is totally Samsung-stock, so while you'll likely be able to back up, you'll probably come a cropper when trying to restoring. With that in mind, to save media files, simply hook your phone up to a PC via USB and copy them across. To save text messages, a good bet is SMS Backup & Restore, a free app in the Play store.

And talking of the Play store, all apps you've installed that way, and often their settings, will normally have been backed



Titanium Backup is considered a must-have app by many



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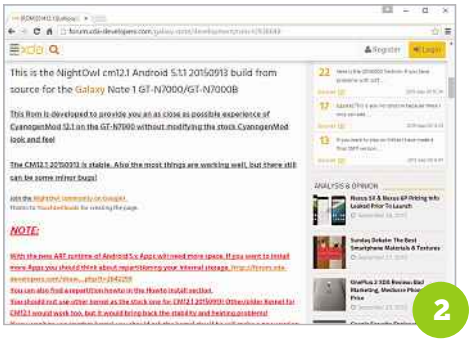
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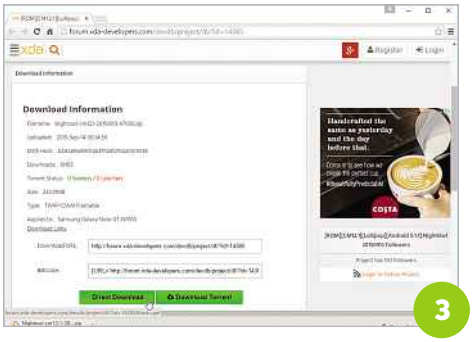
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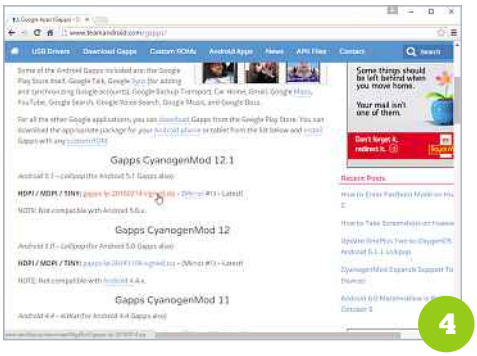

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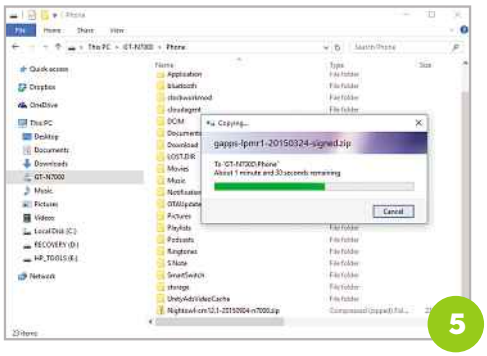
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up automatically to Google's servers. You'll be able to restore these as soon as you log into your Google account in the new ROM. The same applies to Gmail messages and call contacts. Here's an overview: **goo.gl/LU5IrM**.

Now, again as mentioned in part one, there's an app that'll do all the above at one fell swoop: Titanium Backup. It's in the Play store. One snag is that some features – including text-message backup, unfortunately – are only available in the paid version, currently costing £4.11. Another snag is that your phone needs to be rooted – a subject I've handily covered in Taking Root.

Step 1

First, find a ROM. The best place to look is probably **forum.xda-developers.com**. This caters to all brands of Android phone, not just Samsung. Use the search bar at the top to locate your model – the *exact* model – then hit the ROMs tab further down the page. You'll see a list of forum threads, each dedicated to a specific ROM. Don't run to the hills at the sight of all those codes and funny names!

Step 2

Spend some time skimming through the threads. See what people are saying. What sort of ROM do you want? A slimmed-down job that's as nippy as can be? One with oodles of customisation options? Or are you simply after a more up-to-date version of Android? Pay attention to users' bug reports, as custom ROMs often fail to get some phone features to work – the cameras, FM radio or GPS, for example.

Step 3

Most ROM threads provide installation instructions, but these often assume previous knowledge of how things work – hence this guide! So once you've found a ROM you like, click the download link. For my Galaxy Note, I've chosen NightOwl, derived from the Android 5.1.1 ROM by CyanogenMod (the biggest name in non-

Taking Root

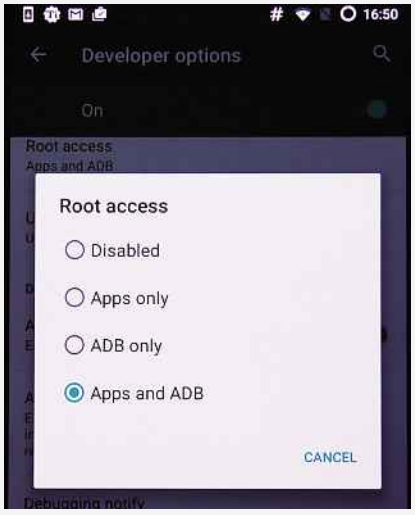
Throughout both parts of this guide I've talked about rooting. But what is it? Well, Android is based on Linux, so by default your phone's system areas are protected against improper access. This stops rogue apps from tampering with crucial files or executing malicious code, and it also means you'll have a hard time screwing anything up and rendering the phone unbootable.

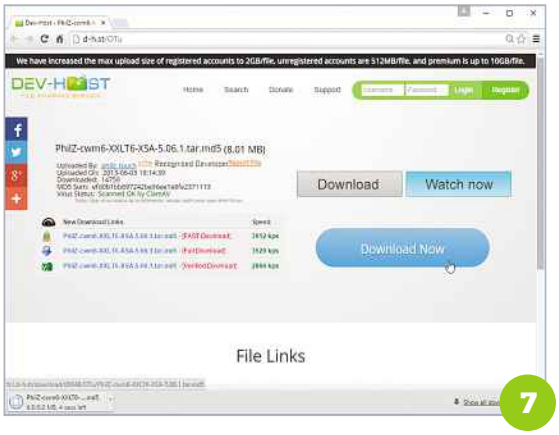
Basically, rooting will remove this protection. Both you and your apps will gain 'superuser' privileges. Yes, there are security risks, but a dose of common sense usually lets the pros outweigh the cons.

Most custom ROMs have root access baked in, though often it still has to be enabled. With CyanogenMod-based ROMs, such as my Note's NightOwl, enter the phone's settings, tap 'About device', then tap 'Build number' seven times. This will unhide 'Developer options', also in the settings. Within that, ensure root access is switched on for both apps and ADB (the Android Debug Bridge).

Manual rooting is phone-specific. Different models require different methods. For a stock ROM, see what's what by running a general search in, say, **forum.xda-developers.com**. Often a one-click PC utility will be available. For a custom ROM, details will normally be given in the forum thread. Usually you'll find there's a rooting option in recovery mode.

▼ *Most custom ROMs are pre-rooted*





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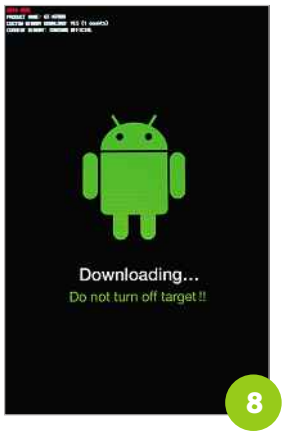

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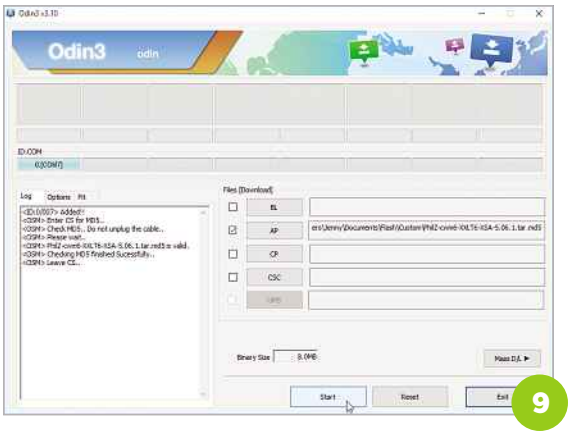

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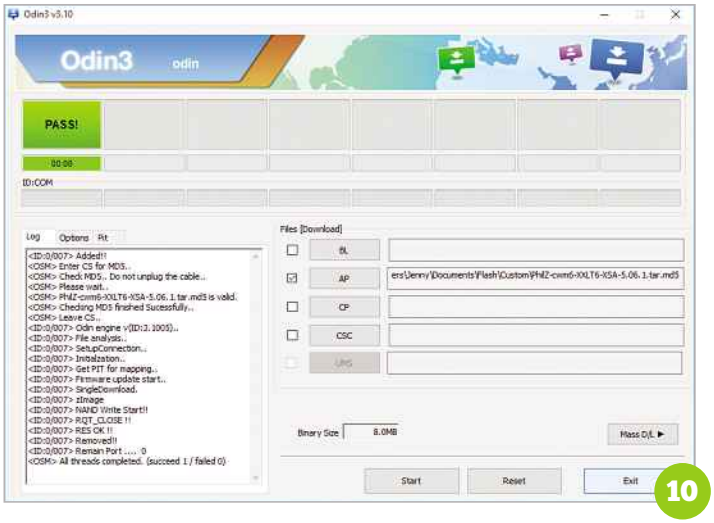

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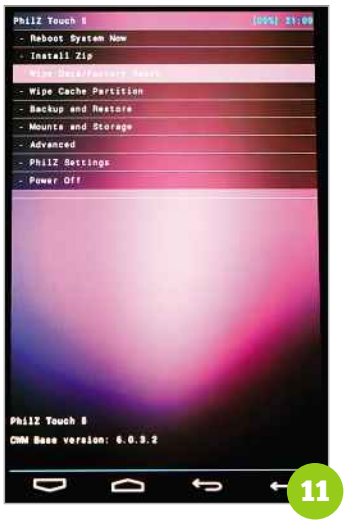

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Google Android development). Officially, the Note only goes as far as Android 4.1.2!

Step 4
Android itself is open-source, so developers can do with it as they please, but Google's apps are proprietary. Legally, a custom ROM can't include them. To get Gmail, Maps and the like, plus access to the Play store, you need to download the 'gapps' bundle that matches the ROM's version of Android. For me, that's the 5.1.1 bundle. If the ROM's forum thread doesn't provide a link, visit **www.teamandroid.com/gapps**.

Step 5
Your ROM and 'gapps' downloads will both be .zip files – do *not* unzip them. Connect your phone to a PC via USB and access its storage. This will usually show up as Phone. Drop the files into the root folder – the place where you can see all other folders (DCIM, Ringtones, and so on). Alternatively, if your phone has a micro-SD card (this will usually show up as Card), you can drop the files into the root folder of that.

Step 6
Next, equip your PC with Samsung's USB driver. This comes with Kies, Samsung's update and backup software, but if you don't have that set up (probably a mercy!), download and install this stand-alone job: **goo.gl/GTqyGn**. You also need to download and install Odin, the semi-official Samsung flash tool you'll be using shortly. Grab the latest version, which is currently v3.10.6: **odindownloader.com**.

Step 7
Now you need to update your phone's recovery image. This is a system partition that provides emergency reset and update options, but a custom replacement will also provide options for flashing new ROMs. Recovery images are phone-specific, so download what's recommended in your forum thread. It'll be a variant of ClockwordMod Recovery (CWM) – as in my Note's case – or Team Win Recovery Project (TWRP). If it's a zip, unzip it.

Step 8
And… action! Make sure your phone's got plenty of juice or plug it into a charger, then put it into download mode: switch it off, then switch it back on by simultaneously pressing the volume-down, home and power buttons. As mentioned in part one of this guide, it can be tricky to get this right, but when you do, a warning screen will appear. Pay it no heed: press the volume-up button to continue.

Step 9
If you've unplugged it, reconnect the phone to your PC via USB. Next, launch Odin. The first ID:COM box will turn blue and display a number, and you should then click the AP button (labelled PDA on older versions) and open your new recovery file (unzipped). Don't mess with Odin's settings; only Auto Reboot and F. Reset Time should be ticked (these are hidden under the Options tab on recent versions).

Step 10
Now click Start. Strap yourself in. You'll see progress bars – blue on the phone and green in Odin. Wait while Odin works through the following stages (don't worry if they're slightly different in your case): KERNEL, RESET!, and PASS! It'll be over in mere seconds. Your phone will then reboot, and you can unplug it from the PC now if you like. You can also close down Odin; you won't be needing it again.

Step 11
Now boot the phone into recovery mode: switch it off, then switch it back on by

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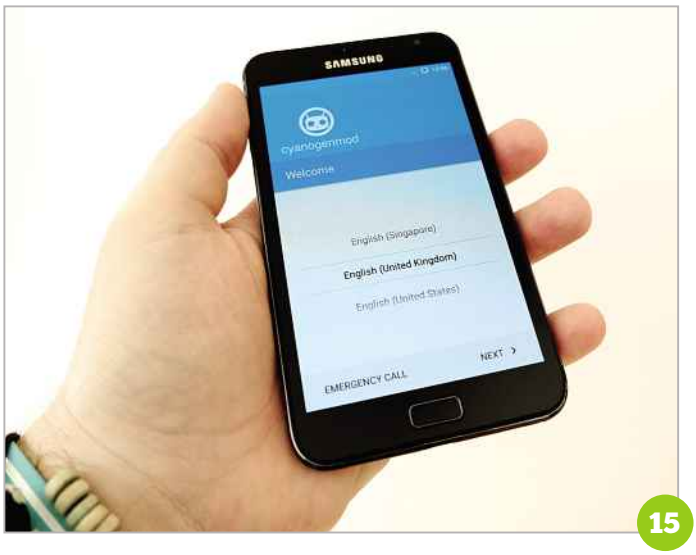

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simultaneously pressing the volume-up, home, and power buttons. Yes, volume-up this time, not volume-down. Again, it can be tricky. Once you're in, you'll see a text menu. The interface works by touch, but if you prefer you can use the phone's volume buttons to move up and down the options and the power button to make a selection.

Step 12
First, select Wipe Data/Factory Reset. Follow this with 'Clean to Install a New ROM' and then Yes. You'll see Andy the Android with a blue update thing in his tummy. Once the clean-up is finished, tap the screen to return to the main menu or press any key. Next, select Install Zip followed by 'Choose zip from Internal sdcard' – or 'Choose zip from sdcard' if you took that route. Lastly, select your ROM file (zipped) and then Yes.

Step 13
The update should be done in a few minutes – expect a fair bit of gobbledygook scrolling before your eyes. When prompted, tap the screen to continue or press any key. Once again, select 'Choose zip from Internal sdcard' – or 'Choose zip from sdcard' – but this time pick your 'gapps' file (zipped). Finish with Yes. After some more gobbledygook, tap the screen again or press any key, then select +++++Go Back+++++.

Step 14
Back at the main menu, select Reboot System Now. You'll then have two choices: No or 'Yes – Fix root'. Pick either, as it makes no difference; the phone will *not* be rooted either way. Now simply wait while Android sets itself up and installs all those lovely Google apps. This is the longest stage: it could take up to 15 minutes. If progress seems to hang on the ROM's splash screen, be patient; it's normal.

Step 15
And that's it! However, if the splash screen gets stuck for more than about ten minutes – now or after a future reboot – enter recovery mode and wipe the system cache and Dalvik/ART cache. If you're still in trouble, re-enter recovery mode and try a factory reset. This will wipe all apps and all app data (though the 'gapps' bundle will be automatically reinstalled), but with custom ROMs that's all part of the… er… fun! **mm**

Final Thoughts

In part one I explained that every Samsung ROM has a CSC (carrier sales code) that defines its intended region and network. Well, worry not with custom ROMs: they're all network-free. However, this doesn't mean you can turn a phone locked to Vodafone into a phone that'll work on O2 – to use a typical example. You'll still need to buy an unlock code. Sorry! A phone's network eligibility is linked to its IMEI and held on an external database.

Last week, I also wrote that most newer Samsung phones have the Knox security feature. This relies on an internal flag, and doing almost anything unofficial, including flashing a ROM by any means other than Kies or an OTA update, will trip it. Knox isn't included in custom ROMs, but a tripped flag will usually render it forever unusable even in stock ROMs. A phone's warranty can be nullified too, at least in the US. Beware! Read all about it: **goo.gl/JoAdF5**.

Finally, if you're planning to tinker with ROMs a lot, consider a ROM manager. You can install this in a custom ROM or a stock ROM, though your phone needs to be rooted. The managers from CWM and TWRP, the recovery-image developers, are probably the most popular. They're in the Play store (the standard versions are free). A ROM manager will set up a recovery image, provide a list of compatible ROMs, find the correct 'gapps' bundle, automate installation, and also offer backup and OTA-update options – almost on a one-click basis.

A ROM manager can make life easier if custom ROMs become an addiction

Code With AI2

Where Was I?

Build an Android route mapping app with David Briddock

Last time we introduced the GPS sensor component and built an app to plot our current geo-location on a map. This time we'll enhance the app to display a route between a previously saved GPS location and our current position. Remember, all you'll need to play along is a Windows/Mac/Linux PC, web browser and Google account. You'll need access to an Android smartphone or tablet with GPS functionality to test this app.

What We'll Learn

In addition to adding more user interface components we'll use a File component to store a geo-location. This means if the app is closed or the phone switched off we can recover the stored geo-coordinates.

We'll also modify the DataActivity.Uri string value to generate a route map between the two points. Let's get started.

Starting AI2

In your browser, navigate to the AI2 home page (**ai2.appinventor.mit.edu**) and sign in with your Google account. Select the My Projects menu option and choose the project we created last time, namely the one called 'MMLocation'.

We're placed in Designer View mode and can see the Label1, LatLong, MapButton, LocationSensor1 and ActivityStarter1 components that we added to Screen1 last time.

Save Button

We want to be able to save a particular location. So we need another Button from the User Interface group. Grab one and snap it into place just below the MapButton.

With this button selected rename it to 'SaveButton', then set the FontSize property to 20.0 and the Text to 'Save Coordinates'. As we did with the AddButton last time for now we'll disable this button by removing the tick on the Enabled checkbox.

Saved Coordinates

It would be helpful to display the stored coordinates on the screen. First grab a Label component and drop it underneath the SaveButton. With this label selected use the Property panel to set the FontSize to 24.0, click on the FontBold checkbox, set the TextAlignment to 'center' and set the Text to 'Where Was I?'.

Now we need another Label component. Grab one and drop it underneath the last label. With this label selected rename it to 'SavedLatLong', then set the FontSize to 20.0, the TextAlignment to 'center' and the Text to '0,0'.

Route Button

We also need a way to generate a route map. Back in the User Interface group grab another Button, then drop it onto Screen1 just below the SavedLatLong label. With this button selected rename it to 'RouteButton', then set the FontSize to 20.0, the TextAlignment to 'center' and the Text to 'Show the Route'.

Once again we'll initially disable this button by removing the tick on the Enabled checkbox.

Invisible Components

To store the current coordinates we need some sort of storage component. As we're only storing a simple text string a File component is fine.

> **"The app displays a route between a previously saved GPS location and our current position"**

From the Storage group grab a File and drop it onto the Screen1 area. Notice that it appears in a Non-visible Components area underneath the screen as well as in the Components panel.

Enable Save Button

It's time to start coding now, so click on the Blocks view button located on the green bar. First we need to enable the save coordinates button when we have a valid geolocation.

Grab a green 'set SaveButton.Enabled to' block, drop it inside the brown 'when LocationSensor1.LocationChanged' block

right at the end (just after the green 'set MapButton.Enabled to' block). Set its value with a Logic group 'true' block.

Save Coordinates

Next we'll handle the save operation. First grab a global variable called 'geofile' and set its value to a simple Text block string of '/geo.txt'. The forward slash prefix indicates the Android device's root folder.

Now to handle the save button click event. Grab a brown the 'when SaveButton.Click' block and drop it into the coding area. Inside drop a purple 'call File1.SaveFile' block. Set the 'text' value with a light green LatLong.Text block, then set the 'fileName' with an orange 'get global geofile' block'.

Directly underneath this block add a purple 'call File1.ReadFrom' block and once again set the set the 'fileName' value using an orange 'get global geofile' block'.

File Read Event

Now we need to handle a geo-file read event generated by the 'call File1.Read' block we just added. To begin drop a brown 'when File1.GotText' block into the coding area.

Inside add a green 'set SavedLatLong. Text to' block and set its value with the 'text' attribute from the parent brown block. Below this block add a green 'set RouteButton.Enabled to' block terminated with a 'true' Logic group block.

Route Button Click

Next, we need to handle a RouteButton click event. Looking at the Blocks View image we can see this is very similar to the 'MapButton.Click' code.

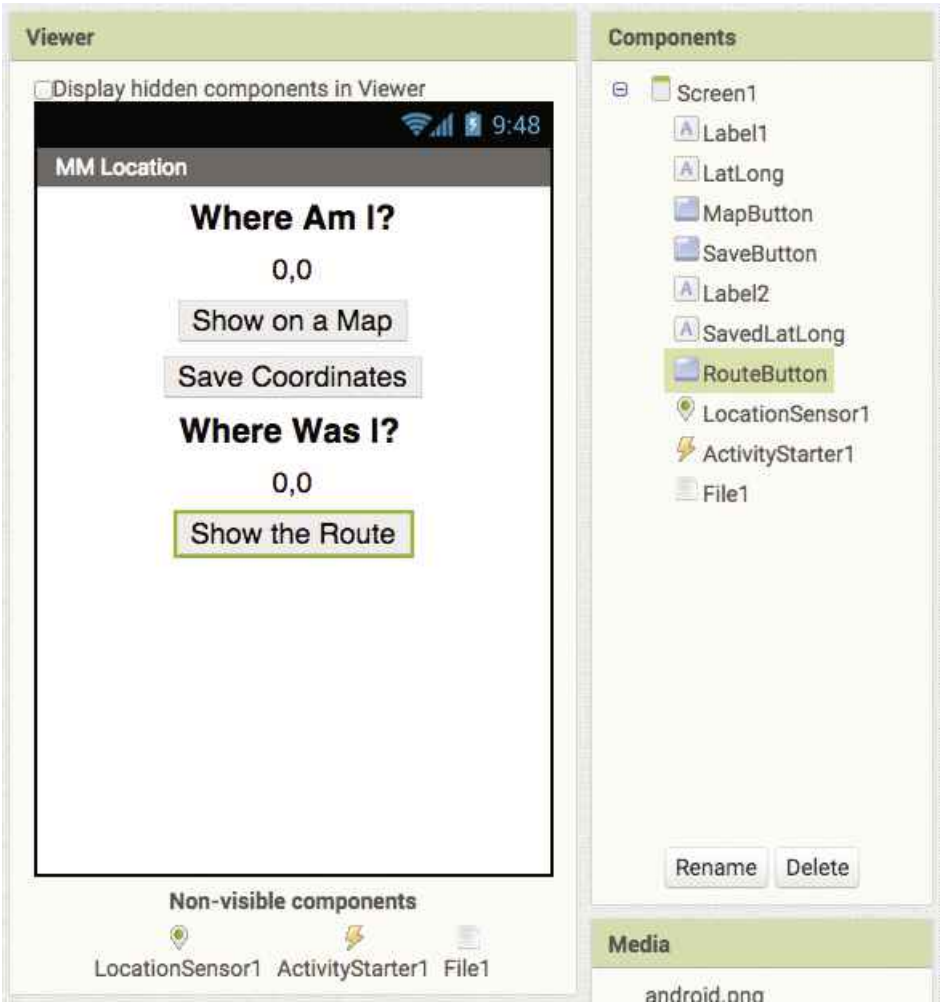
Grab a brown 'when RouteButton.Click' block and drop it into the coding area. Inside there's another green 'set ActivityStarter1. DataUri to' block. Once again we set its value with a magenta 'join' Text block, but this time we'll use the small blue button to make a total of four string items.

Set the first string with a 'http://www.google.com/maps?saddr=' Text block, the second with a light green 'get LatLong. Text' block, the third with a '&daddr=' Text block and the last with a light green 'get SavedLatLong.Text' block.

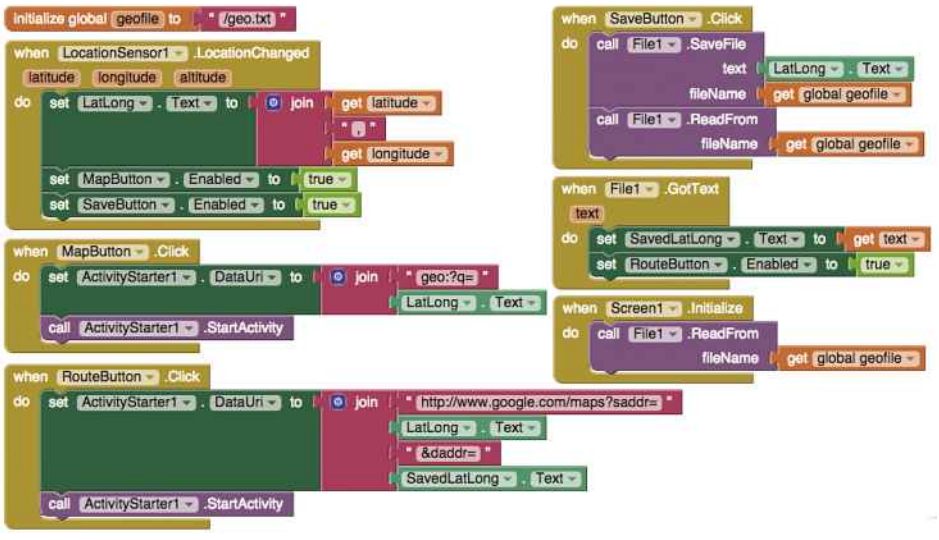
Finally snap a purple 'call ActivityStarter1. StartActivity' block at the end.

App Initialise

Finally, we need to read the stored geo-file data when the app starts. From Screen1 drop a brown 'when Screen1.Initialise' block on the coding area. Inside snap a purple 'call File1. ReadFrom' block and set the 'fileName' value with an orange 'get global geofile' block'.



AI2 designer view

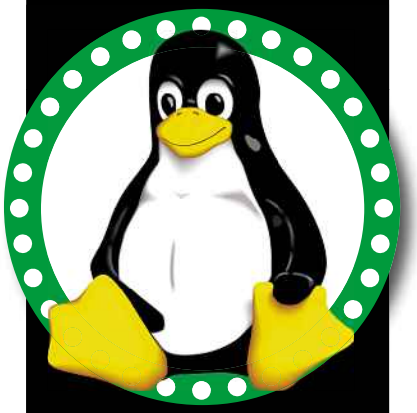


AI2 blocks view

And that's the coding done! Ensure the warning and error counts in the bottom left corner are both zero then carefully check your code against the Blocks View image. Test with the AI Companion App installed on an Android device (as we discussed earlier in the series). Side-load the finished app onto an Android device (goo.gl/ZMKgAe) in case you need to locate a parked car or holiday hotel.

Next Time

Next time we'll build stock quote app, which accesses a cloud-based financial data service. **mm**



Getting By With A Little Help

Stuck on Linux? Where can you go for some advice?

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

One of the major stumbling blocks when it comes to using Linux is the help and advice of others.

For the most part, if you're new to Linux but are pretty canny with computing in general, you can muddle your way through a particular problem without too much difficulty. Even if you're stumped, then a quick conversation with other technically minded users, regardless of whether they use Linux or not, can usually put you in the right direction to solving the problem.

However, there are times when you can get completely flummoxed by a problem, like the one I had the other day.

Let me explain. I installed Skype for Linux and it worked from the off. But after hanging up on a call and trying to start another, the headset stopped working. I first thought it was a problem with the audio setup, so I restarted the sound system with pulseaudio –k followed by pulseaudio –D. The service restarted okay, and I could speak and hear through the headset for other programs.

Skype, though, still didn't work. Then it failed to load up a contact, then make a call, then it failed to start completely. I didn't want to go through the removal and reinstall again, so I thought I'd ask a forum that I sometimes frequent. The only answer I got was:

"Ha! Noob, use something better."

Which wasn't very helpful. Anyway it got me thinking where you could look for reliable Linux help, should you ever need it.

Distro Specific

One of the problems I had with the above comment was the forum wasn't distro specific. Taking it to the Linux Mint forum, my question was solved within a minute of me posting it – politely too, I might add.

While there'll always be trolls in forums, most of the distro-specific forums are populated with fellow users. Most, if not all, of these users are more than happy to help someone who's stuck or who needs advice regarding the distro in question.

Linux Questions

LinuxQuestions.org is another good forum to visit. There's a range of newbie-related information and advice for users all the way up to experts, and it's frequented by people who are happy to help.

There are sections for distro-specific content, but also sections that cover a particular element, such as hardware, networking, software, security and so on. If you're ever in need of help, it's certainly a site worth bookmarking.

Linux.com

Linux.com and the Linux Foundation are the backbone for Linux on the internet and in the real world. You can find pretty much anything you'll ever need to know with regards to Linux within the site, but in this instance, the Learn Linux section is the one worth looking at.

Within the Learn Linux section you'll find answers to questions from users, documentation, tutorials, regularly updated user guides and even careers advice for Linux users.

The content ranges from beginner through to more advanced and covers near every aspect of the operating system.

Where Else?

These are just a few examples we use when we're a little stuck. Of course, you could just Google the question and see what pops up, but you could be led on a wild goose chase after the answer.

Where else is a good place to look for help and advice? We'd like to hear what you come up with, so do write in and let us know.

Linux.com, a great place to look for help

...The Story Continues

Sven Harvey returns with more from the Amiga scene

I hope you enjoyed the two-part look back at the Amiga platform in recent Micro Mart issues, and look forward to learning more about not only classic era Amiga products but more 'next gen' Amiga news and details as the number of products associated with Amiga OS4.x increases.

A1222?

Following the brief glimpse of the new Amiga motherboard, monikered Tabor recently, A-Eon Technology has put out a full press release regarding the motherboard and its itended initial home, in the form of the AmigaOne A1222 machine.

The motherboard has been developed by Ultra Varisys under commission from A-Eon in association with Acube srl, which has already seen prototypes go out to developers, and ports of various Linux distributions are already underway as well as AmigaOS 4.1 FE. A full (and oversubscribed) beta test programme of the board is about to get underway.

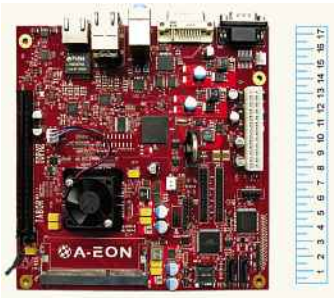
Although we don't know what the full machine will look like, with the motherboard existing as a 17 x 17cm (mini-ITX) unit, it can fit in an Amiga 1200 style casing, so hopefully the full AmigaOne A1222 will look familiar. I do wonder if the recent Kickstarter A1200 cases or even the X500 Pro (keep an eye on Kickstarter) may come into play here?

Initially, the board features a Freescale QorIIQ P1022 dual-core 32-bit CPU running two e500V2 cores at 1.2GHz. This is essentially the little brother to the CPUs due to be used in the AmigaOne X5000 machines, for which pre-orders are due to go live soon.

The board uses 64-bit DDR3 SODIMMs, which seems a bit weird for a 32-bit system, but the P1022 is a system on a chip design with a 64-bit memory controller. As a SoC, there are also other built-in system functions on the processor. The board will offer gigabit Ethernet and two SATA 2.6 controllers, as well as two internal and two external USB ports, and the x16 PCIe connector supports RadeonHD cards, which are the general target graphics boards for AmigaOS 4.x. There's on-board sound and basic HMDI 1.3 graphics output up to 1080p, and along with a JTAG, the board also features a micro-SD based BIOS, which also allows for the possibility of booting the system entirely from that medium.

The press release also refers to the board as part of A-Eon's A1200 series, perhaps suggesting mini-ITX boards with faster (64-bit?) processors may be on the cards if this does well. Aand hopefully the boards have plenty of frankensteining expansion potential in the same vein as the original Commodore Amiga 1200 and its ability to be expanded to run OS4.1 FE classic!

You can find the original press release at **goo.gl/OlnCZo**, and for more information on the P1022 processor itself, there's a data sheet at **goo.gl/rm3q7Z**.



Accelerate Your Amiga 600

A small company in Poland by the name of Lotharek has released an Amiga 600 accelerator, developed by Boris Krizma, via eBay.

Fitting over the CPU with a secondary socket, basically piggy-backing as with all A600 accelerators (basically they're hacks as the A600 wasn't originally designed to take accelerator/CPU cards), the board, named Furia, includes a 33MHz 68ec020 processor, MMU and 9.5MB of RAM, along with MapROM functionality and software ability to switch off some of the RAM to enable the PCMICA socket to be addressable.

Getting A600 accelerators to work reliably can be a bit of a dark art, as I have personally discovered with boards from the dim distant past such as the Viper 630, so bear that in mind

Have a look at its items for sale over on its eBay account at **goo.gl/Vt5Alp** and its website is at **lotharek.pl**.

Sven Harvey has been our Amiga specialist for over 16 years, drawing on his 25 years retailing computer and video games and even longer writing about them

Amiga

Cheap Like A Fox

Ian McGurren checks out the new phone animal on the block

Ian McGurren is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

With it coming up to the most expensive time of the year for those of a generous nature, many people are starting to look at what's the best value for money that they can get for Christmas. This year, as ever, technology is a popular purchase, with smartphones often at the top of the list, and if you or the kids have been perusing the web or the Argos catalogue, you might have come across a new name, Wileyfox. So who is it, and are its products any good?

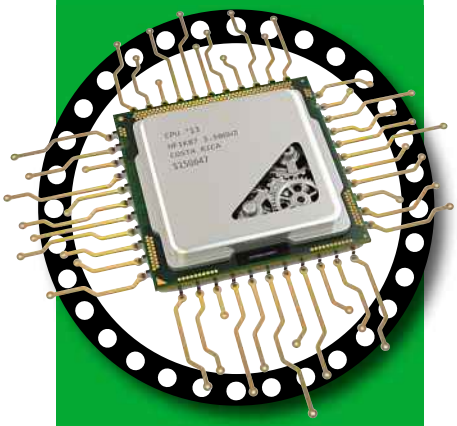
Sadly not the brainchild of UK Grime MC Wiley and former Page 3 model Samantha Fox, Wileyfox does position itself as a British company – well, it claims to be "headquartered" in London. However there are rumours that Wileyfox is a brand name of Chinese phone manufacturer Fly, and its products are very similar to some that Fly has in its range. Not that it changes anything about the devices themselves (after all, most phones are made in China anyway), but it is a little disappointing that Wileyfox may be as British as chow mein.

So to the handsets themselves, the Storm and firstly its little brother, the Swift. Like many of these low-end phones, there's an easy phrase to sum up the Swift: 'it's just like a Moto G'. How much like the Moto G? On a scale of 1 to 10, it's in the top end for sure. There's the standard issue 5" 720p screen, plus a 1.2GHz quad-core Snapdragon CPU, dual SIM, 13MP camera with flash and an SD card slot (curiously only up to 32GB apparently). But it does offer some bonuses not always seen in phones of its price: the CPU is 64 bit, there's 4G capability, it looks pretty good and slim compared to the competition, and it comes with Cyanogenmod. And while that's not quite as good as being a Google Play device, it's probably the next best thing.

The Storm takes the decent specs of the Swift and, not surprisingly, goes bigger in every way. The screen not only gets a half-inch bump to 5.5", but the resolution is now full HD. The CPU gains four more cores with the octo-core Snapdragon 615, the on-board storage is now an impressive 32GB and the camera now features a 20MP Sony Exmor sensor. Like its sibling, the Storm also runs Cyanogenmod out of the box, though Marshmallow 6.0 is yet to make an appearance. There are other caveats too, such as the second SIM slot shares space with the micro-SD slot, so you have to choose one but not both. But for a large handset, it really isn't too bad at all.

So where do the Swift and the Storm sit in the current market? It's not as clear cut as it used to be a couple of years back. The Swift is smack-bang in the middle of what is now a very crowded section of the market, king of which is arguably still the Moto G. The choice at this price is down to taste, and personally I would still go with either the aforementioned tried-and-tested Moto G or even a value handset, such as a Nokia 635 for around half the price. Likewise, a year or so ago, the Storm would have been a very good bet for a budget phablet. But with LG's former flagship, the G3, complete with 2K screen and superior build now going on the high street for only around £30 more, the Storm doesn't look quite such good value. But all is not lost for Wileyfox, however, as come the January sales, both will likely drop in price, and for £99 / £149 respectively, they could well be worthy of a good look. Sadly, nothing can help that name, though...

It's Black Friday, I'm Not In Love



Andrew Unsworth insists he isn't miserable; he simply doesn't like the latest high-street 'tradition' to hit our shores

Without wanting to sound like a curmudgeonly old git, there are some new traditions, such as Halloween, that I've learnt to tolerate. Then there are others, such as Black Friday, that I absolutely detest and will resist until societal pressure forces me to don a false smile and scrap for a no-brand TV I don't want.

The first Halloween I remember was one that occurred sometime in the mid-80s, and although there were some grumblings about it being an imported American tradition, most people didn't mind having a bunch of kids wearing plastic skeleton masks and bin bags knocking on their door begging for sweets. At that time, there was a definite emphasis on supernatural horror and the idea of the deceased rising from the dead, which excited me as a nipper and fired my imagination.

Nowadays, Halloween is a shallow, consumerist affair that has entirely ditched the false pretence of being a Christian feast day. Every store is packed full of pumpkins, a fruit upon which my eyes had never been clapped until well into this century. I used to hollow out a turnip and stick a candle in it or borrow my grandad's paraffin lamp and tread the streets with that. I can still remember the sweet, chemical smell of burning paraffin and the tasty, earthy aroma of an internally toasted turnip. Pumpkins don't smell the same, they taste horrible, and they don't feel traditional. In much the same way, supernatural-themed costumes have somehow morphed into little princess outfits and superhero costumes, which all serves to make Halloween feel exactly like the excuse to spend money on rubbish that no one needs that it always was but pretended not to be.

The same is true of Black Friday, but unlike Halloween, this 'tradition' is completely honest about its consumerist nature, and it hasn't even bothered to piggyback a religious holiday to extort money from your wallet via peer and societal pressure. Instead, it relies on greed, with people savagely competing to buy stock that retailers otherwise can't shift, all at discounted prices that could only seem a bargain in the white heat of battle and with the subtle effect of expectation and suggestion applied.

I'm always happy for people to buy tech. I enjoy buying new tech, and I'd be a hypocrite if I didn't allow other people the same pleasure, but the carnal clashes witnessed during last year's Black Friday sales seemed to have little to do with bargain hunting and everything to do with competition. News reports showed people being assaulted and having their new prize prised from their hands before they could pay for it. My first reaction was to be appalled, but any sympathy soon disappeared. If you live by the sword, you die by the sword.

All of this is unnecessary. There are better, more efficient and financially beneficial ways of snagging a tech bargain than bouncing your neighbour's head off a gondola end. If you want to bag a bargain this Black Friday, decide how much you want to spend in advance, decide exactly what you'd like to buy and then search the internet for the best price. If you don't want to buy online, pop in a shop and haggle. Be prepared to walk away. When you've set your heart on buying something and it isn't available, it's easy to buy a lesser item on impulse just to buy something, but you'll regret it later. It's better to buy something you do want at the cheapest price you can find than something you don't want that's been given a dubious discount. Happy shopping.

Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Adventure Time

The Fighting Fantasy series is moving off the page and on to our screens in the form of Tin Man Games' 'digital reimagining' of The Warlock Of Firetop Mountain

This week, Ryan checks out the videogame adaptation of a classic Fighting Fantasy book, and checks in on the latest newsfrom Blizzard's Overwatch...

Plug & Play

For some, probably readers of a certain age, the words 'Fighting Fantasy' will have a special resonance. A series of roleplaying adventure books conceived by Steve Jackson and Ian Livingstone, they were highly successful throughout the 80s. Indeed, the first in the series, *The Warlock Of Firetop Mountain*, sold around two million copies.

Affection for the *Fighting Fantasy* books has never quite gone away, either. Though the the series ended in 1995, the 25th anniversary of *The Warlock Of Firetop Mountain* in 2007 was marked by a special edition release, and it's also appeared in digital form as a Kindle edition and as an iOS app.

Now, Australian developer Tin Man Games is now set to go one step further with a "digital reimagining" of that first Fighting Fantasy book; where the studio's earlier adaptations were entirely text based, its rendering of *The Warlock Of Firetop Mountain* will be more akin to a proper RPG videogame, with 3D graphics and a real-time combat system.

As in the book, the aim of the game is to journey into Firetop Mountain's shadowy dungeons, locate the evil Zagor and claim his treasure. In Tin Man's take on the tale, however, you'll be able to assume the roles of different characters – even Zagor himself. Each character will have "their own motivations", which will change how the adventure pans out.

With much of the pre-production on the game already complete, Tin Man recently turned to Kickstarter to help fund the cost of producing all the additional assets to the game, and it's fair to say the response from the book's fans has been warm so far; within a few days, the campaign soared past its $15,000 minimum goal, and its total is currently sitting at the $37,000 mark at the time of writing. Looking at the game's pitch video, it isn't difficult to see the appeal; the murky dungeons richly described in the book are now fully realised, yet the concept of the original Fighting Fantasy gamebook is still present and correct. Now, the critical moments in the story emerge on the screen as excerpts seemingly torn straight from Jackson and Livingstone's original text ("You listen at the door and hear a rasping sound which may be some sort of creature snoring. Do you want to open the door...?")

For a generation of gamers who carried around dog-eared, well-thumbed Fighting Fantasy books in their school bags, *The Warlock Of Firetop Mountain*'s allure will surely be too powerful to resist. You can find out more at **kck.st/1M3SrkF**, and the game should be available some time in 2016.

Online

It's fair to say that *Overwatch* represents something of a departure for Blizzard. Not only is it the first original franchise to emerge from the studio in 17 years, but it's also Blizzard's first foray into the multiplayer FPS genre (*StarCraft: Ghost* would have been a third-person shooter, but that was cancelled back in 2006). Fortunately, the word from *Overwatch*'s closed beta is that Blizzard has another potential hit on its hand here; nothing less than a wining combination of a typical squad-based shooter and the compact, fast-paced action of a MOBA like the studio's own *Heroes Of The Storm*.

▲ *Overwatch, Blizzard's first shot at establishing a totally new franchise in 17 years, will not follow the current free-to-play trend*

Overwatch is, therefore, something very different from Blizzard, and it's recently been revealed that the company's trying something different with its pricing structure, too. Given the free-to-play models of Blizzard's other recent games, *Hearthstone* and *Heroes Of The Storm*, it was widely expected that *Overwatch* would follow suit; instead, it's taking the surprising step of releasing *Overwatch* as a full-priced game.

What's more, *Overwatch* will be released in three distinct versions, each with its own price-point. The standard edition will sell for $40, and will contain 21 playable characters, while the *Origins Edition* will set you back $60, and come with additional character skins and other bonus items for *Overwatch* and other games in the Blizzard stable. For the truly dedicated gamer, though, the $130 collector's edition will add to that some physical items to clutter up your shelves, including a limited edition book, a figurine, and a copy of the soundtrack.

One obvious question arises: why is Blizzard taking the one-time purchase approach when so many other firms are going the free-to-play route? The answer, according to Blizzard's Jeff Kaplan, is because the game's creators want all of its characters available to all players – not unlocked through the kind of small payments we usually see in free-to-play MOBAs.

"A lot of the free-to-play models that we were exploring involved people not having access to enough heroes to make those team compositions actually viable," Kaplan told *Polygon*. "We really didn't want to change the core gameplay and limit it in some way just to make the game free-to-play."

For gamers with what Kaplan describes as a "fatigue" when it comes to free-to-play games and their tactics, *Overwatch*'s unexpectedly traditional approach should come as a refreshing change. What Blizzard hasn't yet ruled out, though, is introducing addtional characters as paid-for DLC; according to that same interview with *Polygon*, the team's waiting to see how the game's received before it makes a decision over DLC and how much it will cost.

"There was one misconception that we're gonna have 21 [heroes] at launch and then we're going to have a hero store with additional heroes," Kaplan said, "and that couldn't be further from the truth."

Overwatch is scheduled for launch "on or before" the 21st of June 2016, so there's plenty of time for Blizzard to confirm its plans. If it lives up to expectations, this is a game that could join *Warcraft*, *Diablo* and *StarCraft* in Blizzard's formidable portfolio.

Incoming

World Of Warcraft's numbers may be at a low ebb, with its most recent subscriber base reported as 5.5m, but that figure's likely to climb when its sixth expansion, *Legion*, arrives next year. At BlizzCon, the expansion's distinctly lavish cinematic trailer was unveiled (**youtu.be/eYNCCu0y-Is**), preparing us for its tale of demonic invasion in Azeroth. There's also a new hero class, the Demon Hunter, with the demon-slaying all taking place in a new region, the Broken Isles.

WoW may be getting on a bit now – it celebrated its 10th anniversary last year – but it continues to foster a devoted following. As long as such expansions keep causing player numbers to surge, its future will continue to look bright.

Legion is due for release in summer 2016.

▲ *World Of Warcraft's latest expansion, Legion, is due in 2016. It's creators, Blizzard, will be hoping it brings Legions back to the game, too*

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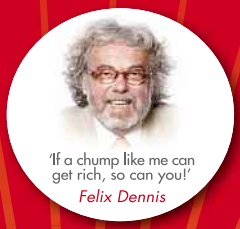

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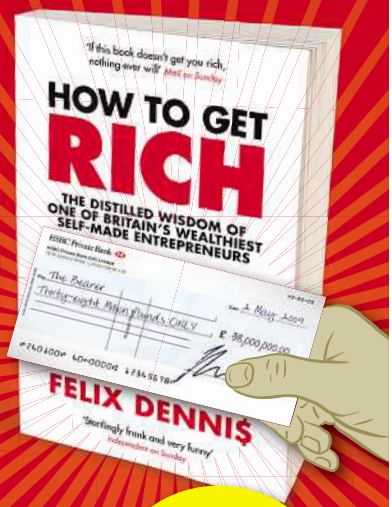

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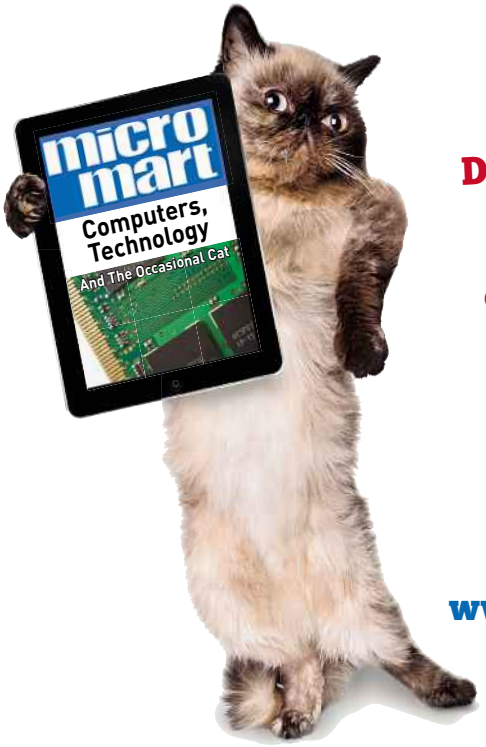

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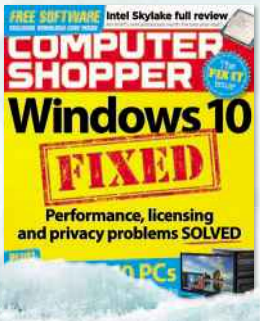

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Aaron

Sneaky GWX?

With reference to your item on p106 of Issue 1386 ('No Need for GWX'), you need to be aware of the following. As I had been having problems with repeated auto downloads and installs of Windows 10, after initially trying it and finding I didn't like it, I was pleased to read the article on how to remove it permanently from my Win 7 Pro system.

I found and removed KB3035583; however, as soon as my pooter rebooted, I got a Notification that there was an update, so clicked on the icon and the link and found an update for Windows 7 x64, numbered KB3102810, which I downloaded and installed.

Upon rebooting a second time, I found another notification for a further update, so went into Updates to see what it was. You guessed it; KB3035583. As I have most of my icons hidden in the Sys-tray, I clicked on the double arrow and found the Windows 10 icon there, much to my surprise, with an invitation to download and install Windows 10.

Being suspicious of Microsoft, I then went back into Installed Updates and found both the KB3102810 and KB3035583 updates installed there under today's date, so again uninstalled the Windows 10 update.

Upon rebooting, it hung on "Configuring Windows. Do not turn off your computer". Five minutes later, it was still there, so I did a hard shut-down, before rebooting. Having got it up and running again, I then dived into Installed Updates again, but this time, no KB3035583.

Clearly, Microsoft used KB3102810 as cover for re-downloading the Windows 10 update, so I think you need to be aware of their devious little ploy.

Now into my fifth year of *Micro Mart*. Great mag. Keep up the good work. You've saved my bacon on many occasions.

Russ

Thanks for the information Russ, it's always good to have our readers provide some useful tips. I've recently become aware of this unfortunate possibility too, and have heard from a few people that later updates seem to have re-applied the nagware that is the Windows 10 app (KB3035583).

Even after you manually remove the GWX update, it would seem as though other updates can also try to sneak this back into your system. This is why I always recommend users set their auto updates to notify them of any possible items that can be applied so they can decide whether or not to install them.

Of course, if updates aren't exactly clear on what they'll do, as seems to be the case with KB3102810, it can still be tricky, even with this manual check in place. For this reason it's always worthwhile noting down any update numbers you're thinking of installing and then checking online to see if there are any issues.

Another little tip to make things easier for people wishing to remove the GWX app: you can do this easily without having to mess around with Control Panel or the Registry. All you need to do is open up an elevated command prompt and type the following:

wusa /uninstall /KB:3035583 /quiet /norestart

Once you press Return, the update will be removed silently, saving you the hassle of doing it the usual way. Just be sure to double-check future updates online, in case the update is secretly slipped in once again.

The pesky GWX app may not stay gone when it's removed, not if Microsoft has anything to say about it

Money Problems

You were helpful a while ago regrading Windows 10 and some programs moving from Windows 7. I'm here with another problem, however.

I have been using Microsoft Money under Windows ME, XP and Windows 7 without any problems. On upgrading to Windows 10, Money Plus worked a couple of times, then started crashing. The fault appears to be when new data is entered into 'Payee' or 'Category'.

A number of comments online show two problems. Either Money Plus needs Internet Explorer 6 to work (not me as I never us IE), or entry of data causes it to close down, which is my problem. This is one of my main, important programs, and I am desperate to get it back working under Windows 10.

Having deleted all programs and data associated with Money Plus, I went to the Microsoft website and downloaded the Microsoft Money Plus Sunset

program and installed it on my Windows 10 PC. It crashes when data entered as before. I then downloaded and installed this program on Wife's Windows XP Laptop. It crashes on data entry.

Surely if Microsoft have a program on their site they should maintain is as usable? Can anyone advise of a fix, or a free accounting program that is as good as Money Plus and has same facilities?

I have tried GnuCash but lacks some functions I need. Interestingly, I have been using Lotus 123 Organiser as my diary. It has worked on every Windows OS version since 1997, and works fine under Windows 10.

Bruce

Sadly, Money Plus was discontinued back in 2009 by Microsoft, with official support being stopped. This is why the program has no real help on the Microsoft website. Money Plus Sunset was released to make up for this but, as has been observed by many, it lacks many features of the previous version, and still has compatibility problems. For this reason, veteran users ideally want to return to the older version.

Aside from the compatibility problems, which are numerous, Money Plus also has the crashing problems you've experienced, but both can potentially be overcome using a couple of fixes or workarounds. Let's have a look and see if we can get your software working again.

First, I'd begin by ensuring you download and install the Money Plus Service Pack 1, if you haven't done so already. You can do this from within Money by checking for updates. Check that this updates you to version 17.x.xxx.1414. Also, try running the program in compatibility mode. It's always worth a shot.

Next, we should look into a possible problem with DEP (Data Execution Prevention) exclusion. With DEP enabled for some apps, especially older ones, problems can arise, so disabling it can fix certain problems. To do this, go into Folder Options via Explorer and click View. Under Advanced Settings make sure you show hidden files and folders, as well as protected system files. Go to System Properties (via Computer > My Computer) and then into Advanced. Click Performance and then Data Execution Prevention. Select the option 'Turn on DEP for all programs and services except those I select' and click Add. Browse to the Money Plus folder ,which should be found in C:\ PRogram Files by default. Here you need to add a number of files, so look for and add the following:

Activate.exe
Daupdate.exe
Extend.exe
Mnybb.exe
Mnyinsit.exe
Msmoney.exe

Now click OK and close all open windows. It may be wise to reboot. Once you do, try Money and see if the problem persists.

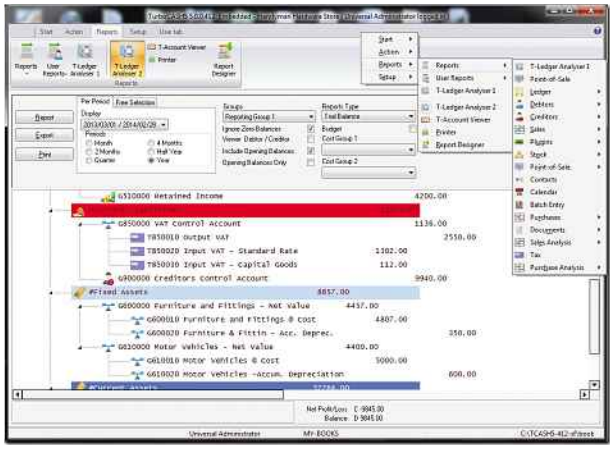
For users getting the Internet Explorer 6 error, there's a trick that may help. This trick is easy enough to implement, but be aware this alters the Registry, so creating a Registry backup and System Restore point is advised.

When you're ready, press Windows+R, type 'regedit', and press Return.

Now, navigate to HKEY_LOCAL_ MACHINE\SOFTWARE\WoW6432Node\ Microsoft\Internet Explorer. In the left-hand pane highlight the Internet Explorer folder and then locate the Version value in the right-hand pane. Double-click this and change the value data to '9.11.10240.0' and click OK. Close the Registry Editor and try running Money. It should open as normal.

Adding DEP exclusions to Money Plus files may fix problems with later versions of Windows

*As for alternative, free programs, you may want to try TurboCASH (**www.turbocash.net**), a decent free package that's open source and features the standard array of options most users need. Another option would be TAS Books Basics (**www.tassoftware.co.uk**). This is actually from a division of Sage, so you can expect high quality software. The Basics edition is free, but does have limits. However, home users may find the free option to be enough for their needs. And, remember, if you really would like to keep using Money Plus, and have an older copy of Windows to hand, you can use a virtual machine to run the older copy of Windows within the later edition, such as Windows 10. I'd recommend you check out **www.virtualbox.org** and download VirtualBox. This is a free visualisation program that can handle this.*



TurboCASH is a decent, free accounting suite

VirtualBox can run any OS, including Windows and Linux

ASK JASON

Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
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jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

In The Air Tonight – Not

I have an Asus Eee Pad Transformer TF101 tablet, complete with the keyboard dock. It's an oldie, but it meets my needs. However, it's running Android 3.1 (Honeycomb), which it came with, but according to Wikipedia there's an update to 4.0.3 (Ice Cream Sandwich). This was released over three and a half years ago, but no alert has ever appeared on my screen. I've just now manually checked for the update in the settings and been told the tablet's already up to date. What am I doing wrong?

Ray, Gmail

You're not doing anything wrong, Ray. Asus had all sorts of bother with its release of Android 4.0.3 for the TF101. The original version was buggy and was quickly patched, and the patched version turned out to be buggy too. I'm not sure how many versions of 4.0.3 Asus put out before getting things right. Another problem was that many people simply couldn't retrieve the update over-the-air (OTA) – which is exactly where you are now.

There's nothing for it: you'll have to update manually. First, find out which SKU (stock-keeping unit) you have. Open the TF101's settings and hit 'About tablet'. Look for the build number, and you should find that this contains WW, US, TW, JP, DE, CN or TB – probably US. Next, head to the official TF101 support page: ***goo.gl/dbt93T****. Expand the Firmware menu and download the update for the correct SKU.*

The download will be a zip file, so unzip it. This will give you another zip file, but leave this one alone and drop it onto the root folder of a micro-SD card. The file will only weigh about 300MB, so virtually any modern card will do. Having said that, I think I still own some 64MB jobs!

To finish off, Ray, pop the card into the tablet and boot up (or reboot if the tablet's already running). Near the clock, at the bottom-right of the screen, you should now see an exclamation mark inside a triangle. Touch this to reveal a message box reading 'System Update File Detected'. Touch the box to launch the update. The entire process will be over in mere minutes.

PS – Android 4.0.3 is a lot more current than 3.1, but it's still pretty old. If you're feeling adventurous, maybe consider installing a custom ROM. There are ROMs based on 4.4.x (KitKat) and even 5.x (Lollipop). Take a look at this XDA Developers page: ***goo.gl/len67r****.*

Often overlooked and underrated, Asus's Transformers can be just the ticket for mixing work and play, and some models are available second-hand for only about £75

Under Pressure

I've recently noticed a couple of very white blobs on the screen of my laptop. One's about the size of a 5p coin, while the other's maybe 50% smaller. They don't appear to affect the picture, but they're quite annoying, especially as the bigger one is near the middle. On a dark background I can hardly see them, but when using LibreOffice, with documents on a white background, they stand out a lot. What are they? Can I get rid of them?

A Edwards, Gmail

These sound like pressure marks. At the back of an LCD screen is a diffuser. This is a layer of plastic that ensures even distribution of the backlight, which usually comprises just two LED or CCFL lamps (or sometimes just a single lamp) located at the top and bottom or sides. The rear of a diffuser is reflective, and it's this mirror-like surface that's typically clearly visible when a screen is removed from its host device.

*Anyway, if any area of a diffuser becomes damaged or gets pressed up against the actual screen, the result is one of these extra-bright blobs. As you've found, no pixels are usually affected – they should operate as normal and produce the expected range of colours. Those blobs sure are annoying, though. I've seen them on laptops fresh from the box, doubtless caused by careless production (and reason enough for an RMA). Most often, however, they're what happens when objects are dropped or stacked on a laptop's lid.**

The White Stripes

Here's another problem with a laptop screen, this one a bit more serious…

I've got an Advent Verona laptop. It's a solid workhorse, and surprisingly, seeing how it's old and weedy, it became eligible for the free upgrade to Windows 10 (originally it had Windows 7), which I'm now enjoying. The specs are listed below:

CPU: Celeron M 743 (single-core, 1.3GHz)
Memory: 3GB DDR2
Storage: 250GB SATA-2
Display: 13.3" (1366 × 768)
Graphics: GMA X4500M (integrated)
OS: Windows 10 Home (32-bit)

Sadly, a few weeks ago, two thick white bands appeared down the centre of the screen. They're separated by a thinner green line. Obviously these lines make work very hard, as they obscure quite a substantial area. Can this problem be fixed, do you think? I've been told the cause could simply be the internal cable that attaches to the motherboard. What would the cost be?

Marcus Walsh, Cumbria

Can you make the defect better or worse by wiggling the screen up and down on its hinges? Is there a perfect angle that causes the defect to vanish? If so, there's a cable fault. But I doubt that's the situation here, Marcus, as a search on eBay reveals that this exact problem is quite common on the Verona. It seems to be a design flaw with the actual screen.

A replacement screen, without the fault, can be bagged on eBay for about £35. All you'll need is a cross-head screwdriver and a couple of hours of patience. This is definitely the way to go (you'll find it much easier than you probably imagine), as a shop would likely charge around £100 altogether, and that's more than the laptop's worth. Usually there'll be a video tutorial or a step-by-step photo guide, but I've come up empty for the Verona. Still, all laptops are built along similar lines, so no doubt you'll be able to hunt down a walkthrough for a different Advent model.

First off, be sure to unplug the laptop and take out the battery. The next step is normally to remove the screws from the corners of the screen's plastic bezel. You may have to prise off the rubber caps first. A spudger or credit card or similar implement can then be used to unclip the bezel from the laptop's lid.

If the bezel remains attached at the hinges, there may be a plastic strip above the keyboard that also needs to be unclipped. If you're really unlucky, it could be necessary to unscrew the laptop's base. One method or the other should now make the hinges accessible, and you can then unscrew them and slide the rest of the bezel off.

It should then be a simple matter of unscrewing the metal retention brackets you'll find to the left and right. The screen should now swing free. Be careful, though, Marcus – it'll be attached to the motherboard by the ribbon cable we talked about earlier. Unclip this. To fit the new screen, just reverse the entire process. Of course, different laptops require different disassembly methods, but what I've described here is more or less all there is to it.

➤ If you've got a laptop needing a new screen, have a go at fitting it yourself – you *can* do it!

I've read that they can sometimes be 'repaired' by placing a suction cup over the affected area on the rear of the diffuser and gently pulling away, and I can see the logic in that. I'd say it's a risky business, though. You could just as easily wind up with further pressure marks or even dead pixels. It's up to you – stick or twist? If you decide to twist, my reply to Marcus ('The White Stripes') might prove helpful.

** Pressure marks are also likely to occur when undue force is applied to the viewing side of a screen, especially if there's no protective glass. This is why such marks can appear on monitors as well as on laptops and mobile devices.*

➤ Pressure marks are sadly all too common on LCD screens (this image's contrast has been altered to exaggerate the problem)

Crowdfunding Corner

Some crowdfunding projects are huge. Others can be small. And this week, we've got two of the smallest around, as we examine the world of ultra-compact devices

iTouch ID

The iPhone's fingerprint scanner works surprisingly well as a security device, and while some laptops do incorporate the same functionality, it's not easy to add it to any PC – especially if you want something discreet and unobtrusive.

Enter the iTouch ID, which is a fingerprint scanning security device designed to keep as low a profile as possible. Barely bigger than a USB port, it can be used on any Windows or Mac PC and is made with the same super-hard Sapphire glass you'll find in the best smartphones. Its capacitive sensor has a 500 pixel-per-inch resolution, meaning there's no chance of your prints being mistaken, and high-security AES-256 encryption means the information it stores is effectively impossible to extract, so your details are completely safe.

The software with the fingerprint reader allows it to be used as a main login for your OS, but you can also configure it to replace passwords in a variety of situations, including social media clients and messaging programs, or even to lock and unlock specific folders on your system. Almost any place you use a password, you can configure iTouch ID to replace it.

The cheapest price you can guarantee for an iTouch ID fingerprint sensor (in black or grey) is NZD$149 (£65) though there are cheaper early bird tiers, which might still be available when you read this. The project has literally just launched on the day we're writing this, so it's hard to say how good its momentum is, but it's cleared 10% completion in less than a day, so put it this way: we're optimistic.

URL: kck.st/1MAyjXP
Funding Ends: Friday, 11th December 2015

Tingbot

The Tingbot is a Raspberry Pi extension device, which gives a whole host of abilities to the otherwise basic system, including four buttons, a touchscreen, foldable case and a completely new OS. Designed to be an always-on companion screen, Tingbot comes in six different colours, with different coloured buttons available too.

With its versatile hardware and programmable OS, it allows you to make simple interactive apps quickly and easily, with no more hardware purchases required. It already has retro games emulation and a MIDI controller, and some of the forthcoming software includes simple inter-device messaging and image swapping, remote monitoring, weather station updates or a live video stream viewer.

A single Tingbot with all necessary hardware (except the Raspberry Pi) costs £50, though for £5 extra you can customise the case colour and get a full range of 24 coloured buttons. Higher tiers include multiple units, and the project is already halfway to its £40,000 goal after ten days, so we're fairly sure it's going to hit its target. If it does, you'll have your hands on it by May 2016.

URL: kck.st/1ROh7y5
Funding Ends: Wednesday, 2nd December 2015

Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Technocracy

This week, we look at a fun little game that's rather addictive

It's not often we feature an individual game on App of the Week, so when we do it needs to be one that has managed to weed its way into our brains and take up a considerable amount of our time. *Technocracy* is one such game.

Although graphically Android games have come on in leaps and bounds over the last couple of years, almost equalling higher-end titles for PC, *Technocracy* instead relies on its strategy and micro-management to raise it above the competition.

It may not be everyone's cup of tea, but there's a lot of fun to be had in planning out what move to consider next, where best to place your limited resources and how to beat the game and come out on top. In our mind, that's the essence of a good game.

Techno Evolution

Technocracy has you starting life managing a handful of caveman-like villagers. Their technology is virtually nil and their growth rate is minimal. However, with your guidance, the people in your civilisation can be put to work to further their evolution and ultimately break out of the Stone Age and into a more modern society.

There are three main screens to *Technocracy*. The first, main screen is a view of your village and population. You'll see trees, land, houses, fields and a cave in the distance. The population mill around and do several jobs, such as cutting down a tree. Above this is a list of resources per second, what you have in storage and details regarding your population growth and unemployed workforce.

The second screen is where the larger share of the action takes place. Here you'll begin with an explorer and farmer. As your population grows automatically, you can assign an unemployed worker by tapping the relative icon. An explorer will go out look for new land and a farmer will use up some of that land to grow food.

The more land and food you have, the faster the population grows. When you have a set amount, you can opt to evolve your population and move on to the next level, where you can gain new workers.

Features At A Glance

- Free.
- Despite limited graphics, it's very enjoyable.
- A fine balance of resources and workers is needed to evolve.
- Uses limited resources to run Android 2.3 and up.

From there you can then assign lumberjacks, miners, builders, traders, medicine men, scientists, entertainers and soldiers. Each work unit requires an unemployed villager and each will use a resource that another work unit produces.

The lumberjacks, for example, use up land to produce resources. Builders and traders then use up different amount of resources to make houses and money respectively. The medicine men use up resources too, to increase your rate of monetary income and the scientists, entertainers and soldiers use up your money.

Each has a particular role in growing your population and its technology and economical standing. Too many work units on one will affect the others. Likewise, not enough farmers, and you'll have no new population to put to work, due to lack of food.

Addictive Qualities

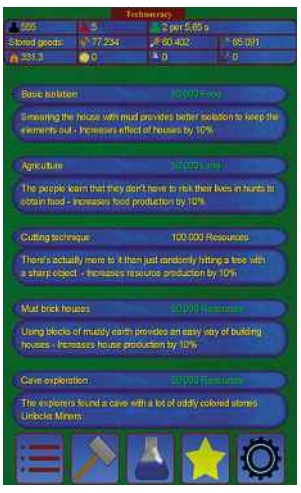
The game looks very simple, with basic graphics and animations, and there are times when the number of resources don't quite add up according to what's written on the work unit. But getting your population into the tens of thousands and trying to achieve the goals to evolve can be extremely addictive.

Like we said, it's not everyone's cup of tea, but we think it's worth having a little play to see if it can infect you with its addictiveness.

It's available from the Play store and iTunes.

The first screen of Technocracy, where you see your population and stats

This is where you'll assign your workers to their units and balance your resources



When you have enough of a single resource, you can upgrade and evolve your workers and units

Logging Off

By the time you read this, the 'fall update', as Microsoft likes to call it, will have landed for Windows 10 users. We can call it the autumn update, and for those in the southern hemisphere it could be the spring update.

As I have a single system on the Fast ring of the Insider Preview, I got Build 10586 about a week ago, and it's basically what is being rolled out to all users as 'Threshold 2'.

Being on this Insider Preview has been interesting, not least because I got to appreciate what an utter mess Windows 10 was in when it launched.

As each new release came along, it usually stomped on the most obvious bugs (but not always) and also sorted out some things that were probably irking the development team.

So is Windows 10 really ready for the big time now? Call me a Microsoft hating cynic, as others have, but 'no. There are just too many ragged edges in Windows 10, and I'm beginning to wonder if that is something that is unlikely to change.

Why? Because (and this was always the intention) Windows 10 will never be 'finished' as such; it will just evolve into the next thing progressively.

That's a problem for users, because it may well be that Windows 10 becomes rather good, and then Microsoft screws it up, and then it becomes good again. And because you have relatively little control over updates, you can't stop Microsoft taking the OS the way you like it and changing it to something you don't care for.

This could be like some game of development Russian roulette, where it spins the chambers until it finds the bullet and everyone stops using Windows.

Those who used OneDrive under Windows 8.x have already realised that development isn't always the ticket to improvement, and there are lots of examples of other software elements in Windows 10 that aren't as good as the ones they replaced.

The most obvious of these is the new browser, Edge, which without plug-ins is relegated to something most people use once and then never again.

What's probably the most disappointing aspect is that Microsoft has made no appreciable effort to address some of the most glaring problems, most noticeably the Microsoft Store which is extremely

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clunky. If it wants people to ever use universal apps, then it really needs to address this part of the solution, because it's mostly redundant at this time.

When Windows 10 first launched, my son asked me when he should upgrade his Windows 7 machine, and I told him to wait to Christmas, when it'll have the worst bugs stomped. At this time I might tell him to wait some more, because I'm still not convinced I'd want to move over to it myself.

And looking at the latest usage stats, I'm not the only person thinking this way, because I can detect that the rate of conversion is slowing. What also hints at this stutter is the way that Microsoft is starting to get particularly aggressive about upgrading people. It's loading the files on their machines without asking and moving the upgrade into Windows Update and ticking it by default. There are three words for this, and they're all 'pushy'.

I'll upgrade when I'm good and ready, or I might not at all, in case Microsoft wondered.

Mark Pickavance

LAST WEEK'S CROSSWORD

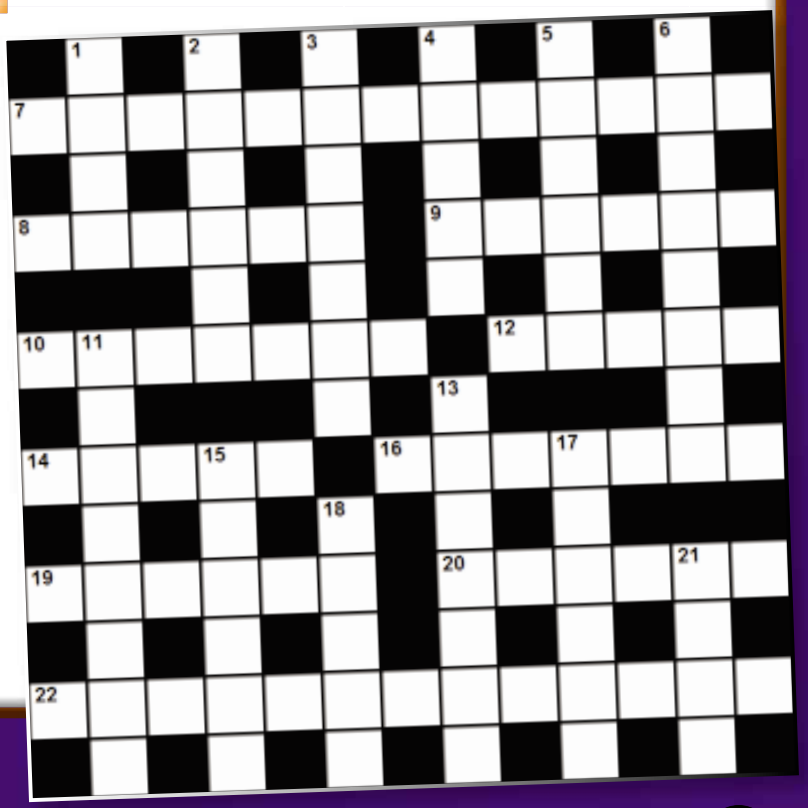
Across: **7** Vernal Equinox, **8** Dynode, **9** Apollo, **10** Chassis, **12** Trick, **14** Click, **16** Power PC, **19** X Games, **20** Incept, **22** Eavesdropping.
Down: **1** Deny, **2** Snoops, **3** Algeria, **4** Squad, **5** Rigour, **6** Foolscap, **11** Hologram, **13** Horizon, **15** Compel, **17** Escape, **18** Aside, **21** Pine.

DISCLAIMER
The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. In case you hadn't noticed, the much anticipated videogame Fallout 4 has now been released. Not that we're particularly excited about that fact or anthing, but you know – FALLOUT 4!!! IT'S OUT!!! NOW!!! Okay, maybe we're a little bit excited. But playtime has to be rationed because work still has to be done, as well as other apparently necessary things like sleeping and eating. Plus we're currently watching Star Trek: The Next Generation from the beginning, so we obviously need to find time to do that too. Speaking of TNG, as Trekkies like to call it, you can probably expect to read more about it in this part of the magazine – unless of course we get bored of it or just do you a favour and decide not to subject you to our musing and Picard and co. Right now, we're not bored with it at all, so we'd like to say a few words about the way in which William Kirk – sorry, Riker – sits down when he enters Picards office. Rather than just move the chair like a normal person, he always swings his leg over the back it, showing the world where keeps the crown jewels. It is just us, or is this more than a little unbecoming for an officer? Sorry, Mr Riker, no Fallout 4 for you!

THIS WEEK'S CROSSWORD

Across
7 01 04. (5,5,3)
8 Transfer data out of a database or document in a format that can be used by other programs. (6)
9 A subtle difference in meaning, opinion or attitude. (6)
10 Leave in the lurch. (7)
12 A small flat rectangular piece of glass on which specimens can be mounted for microscopic study. (5)
14 Large supermarket chain founded in 1919 by Jack Cohen as a group of market stalls. (5)
16 An extremely strong reaction of anger, shock or indignation. (7)
19 A hypothetical one-dimensional object living in extended dimensions in which vibrational states can represent subatomic particles or similar. (6)
20 A main character in the video game *Mother* 3. (6)
22 The number of which a given number is the logarithm. (13)

Down
1 The point on the celestial sphere toward which the sun and solar system appear to be moving relative to the fixed stars. (4)
2 In printing, last words or short last lines of a paragraph falling at the top of a page or column and considered visually undesirable. (6)
3 The removal of oil from a reservoir or supply. (7)
4 Held with another element, substance or material in chemical or physical union. (5)
5 Aggressively challenge in speech or writing. (6)
6 A person or group that monitors the practices of companies providing a particular service or utility. (8)
11 A harmonic with a frequency that is a multiple of the fundamental frequency. (8)
13 Timepiece that indicates the daylight hours by the shadow that the gnomon casts on a calibrated dial. (7)
15 A time of intense difficulty or danger. (6)
17 .ru TLD (6)
18 Urge others to do something; possibly against their better judgement. (3,2)
21 A nymph who was spurned by Narcissus and pined away until only her voice remained. (4)



In Next Week's Micro Mart*

- Special issue! What to consider when buying refurbished PCs, components and tablets
- 30 years of Micro Mart and technology
- Can Google really take on Netflix and succeed?
- Plus the usual mix of news, reviews and advice

* May be subject to change

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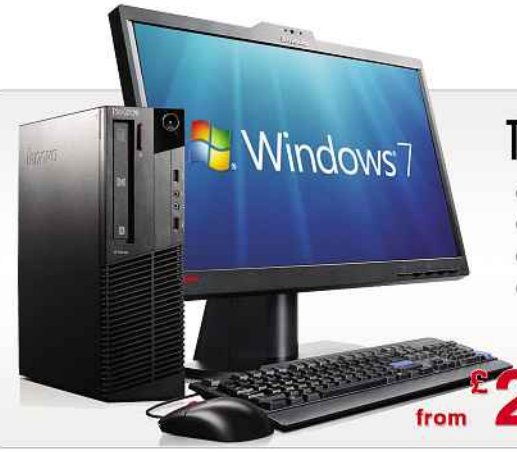

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